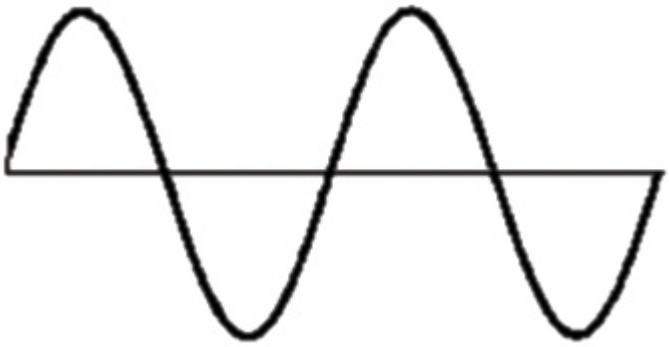
TAYLOR-DUNN®

The Best Way To Go About Your Business

Models Inlcuded:
B0-248-48AC (B 2-48)
B0-254-48AC (B 2-54)



Equipped with AC Motor Speed Control

MANUAL MB-248-11

Operation, Troubleshooting and Replacement Parts Manual

Revision: A

Serial number Starting: 171000

COPYRIGHT NOTICE

Copyright © 2001 by Taylor-Dunn® Mfg. All rights reserved.

No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system without prior written permission of Taylor-Dunn® Mfg. unless such copying is expressly permitted by federal copyright law. Address inquiries to Reference Permissions, Taylor-Dunn® Mfg., 2114 W. Ball Road, Anaheim, CA 92804

TAYLOR-DUNN SERVICE CENTER

For more information about this and other Taylor-Dunn® manuals, please write Taylor-Dunn®:

Taylor-Dunn® Mfg.
2114 W. Ball Road
Anaheim, CA 92804
(Attn: Technical Writer)

B2-48 With Dump Bed Option

B2-10 Ambulance

B2-48 with Steel Cab, Foldaway
4-Passenger Seat and Stake Sides

P2-50 30,000 Pound Tow Tractor

ET 3000

ET1-50 Full Size Truck

Contents

Introduction 1
- About this manual 2
- Who Should Read This Manual 3
- Responsibilities 3
- How To Use This Manual 4
  - Conventions 5
- How to Identify Your Vehicle 6
- Taking Delivery of Your Vehicle 7

Safety Rules and Operating Instructions 1
- Standard Specifications 2
- Safety Rules and Guidelines 3
- Driver Training Program 4
  - Driver Qualifications. 4
  - 1) Horn Switch 5
  - 2) Forward-Off-Reverse Switch 5
  - 3a) Light Switch 5
  - 3b) Hi-Low Switch 5
  - 4) Combination Display 5
  - 5) Accessory Switches (optional) 5
- Vehicle Controls 5
  - 6) Key-Switch 5
  - 7) Emergency Stop Switch 5
  - Combination Display 6
  - Accelerator Pedal 7
  - Foot Brake Pedal 7
  - Steering 7
  - Directional Signals (Optional) 7
  - Hazard Light Switch (Optional) 7
  - Charger Interlock 8
  - Seat Interlock Switch 8
  - Electrolyte Alarm (Optional) 8
- Vehicle Operational Guidelines 9
  - Safety Guidelines 9
  - Starting: 9
  - While driving: 9
  - Loading and Unloading 10
  - Parking 10
  - Towing 10
  - Adjustable Controller Parameters 11
- Charging your vehicle 13
  - New Battery Break in 13
  - Charging Time 13
  - Industrial Charger Operation 13
  - Signet® HB-xxxx Charger Operation 14
  - Lestronic II® Charger Operation 14
- Storing and Returning to Service 15
  - Storing Your Vehicle 15
  - Returning to Service 15
- Periodic Maintenance Checklist 16
  - Daily Visual inspection: 17
- Maintenance Guidelines for Severe Duty Applications 17

General Maintenance 1
- Maintenance Guidelines 2
- Troubleshooting Guide 3
- Lubrication Chart 4

Front Axle Service 1
- Inspect the Front Wheel Bearings and King Pin 2
- Adjust Front Wheel Bearings 3
- Front Axle Removal and Installation 4
  - Removal 4
  - Installation 5
- Front Axle Disassembly 6
- Replace Front Wheel Bearings 7
- Replace the King Pins and Bushings 9
- Replace the Steering Knuckle 11

Steering Component Service 1
- Front End Alignment 2
- Inspect Ball Joints 6
- Inspect Rod Ends 7
- Adjust the Steering Gear 8
- Replace the Steering Shaft 10
- Replace the Steering Wheel 12
- Replace the Steering Gear 13
- Replace the Ball Joints, Tie Rods, and Drag Link 14
  - Replacing the Drag Link 16
  - Replacing the Tie Rod 17
- Center the Steering Gear 18
- Pitman Shaft Alignment 18
- Repair the Steering Gear 19
  - Exploded View of Steering Gear 22

Brake Service 1
- Inspect the Service Brake 2
  - Disc Brake Pads 2
  - Disc Brake Rotor 3
- Inspect the Automatic Parking Brake 4
- Adjust the Automatic Parking brake 4
- Adjust the Service Brakes 4
- Check Master Cylinder Fluid 5
- Bleed the Brake System 6
- Flush the Brake System 8
- Replace Front Disc Brake Pads 9
- Replace Rear Brake Pads 11
  - Hydraulic Disc 11
- Replace the Wheel Cylinder 13
  - Disc Brake Body Assembly (front or rear) 13
- Replace the Master Cylinder 15
- Repair the Master Cylinder 17

Table of Contents

Transmission 1
- **Check Oil Level 2**
- **Change Oil 3**
- **Motor Removal and Installation 4**
- **Rear Hub or Rotor 5**
- **Removing and Installing the Rear Axles (Disc Brakes) 6**
- **Transmission Assembly 8**
  - Remove and Install 8
- **Disassembly and Reassembly of the Primary Reduction Gear Case 9**
- **Disassembling the 3rd Member 12**
- **Assembling the 3rd Member 15**
  - Pinion Bearing Preload 18
- **Pinion Gear Shimming Instructions 19**
  - Setting the Pinion Gear Depth 19

Suspension 1
- **Replace the Rear Springs 2**
- **Replace the Front Springs 3**
- **Replace the Spring Bushings 4**
- **Replace the Shocks 5**

Tires and Wheels 1
- **Tire Inflation 2**
- **Tire Inspection 2**
- **Replace the Tire/Wheel 3**
- **Repair the Tire (pneumatic) 4**
- **Replace the Tire (pneumatic) 5**

Battery Service 1
- **Cleaning 2**
- **Testing 3**
- **Watering 5**
- **Charging 6**
- **Replacing (6-volt batteries only) 7**
  - Moist Charge Batteries 9
- **Storage and Returning to Service 10**
  - Storage 10
  - Returning to Service 11

Control System Diagnostics 1
- Test Equipment Required: 2
- Important Notes and Instructions 2
- Status LED Code Table 3
- Throttle Module Test 6

Lestronic II® Charger Troubleshooting 1
- **Operating Instructions and Theory of Operation 2**
- **Testing the Charging Cycle 3**
- **Test Equipment Required for Troubleshooting 4**
  - Important Notes and Instructions 4
- **Troubleshooting for Built-in Charger 5**
- **Troubleshooting for Portable Charger 8**
- **Testing The Timer Relay 9**
- **Testing the Interlock Relay 10**

Signet® Charger Troubleshooting 1
- **Operating Instructions and Theory of Operation 2**
- **HB/PT and GEL Indicator Lamps 3**
- **Testing the Charging Cycle 3**
- **Test Equipment Required for Troubleshooting 4**
  - Important Notes and Instructions 4
- **Status LED Error Code Table 5**
- **Troubleshooting 6**

Illustrated Parts 1
- Front Axle 2
- Steering Knuckle 4
- Steering Linkage 6
- Steering Column 8
- Front Suspension 10
- Steering Gear 10
- Rear Suspension 12
- Transmission Gear Case 14
- Rear Axle 16
- Transmission Differential Case 16
- Rear Brakes 18
- Front Brakes 18
- Brake Lines 20
- Master Cylinder 20
- Motor 22
- Motor Mount 24
- Wheels and Tires 26
- Instrument Panel (dash) 28
- Wire Harnesses 28
- Speed Control Panel 30
  - Resetting the Maintenance Meter Function 31
- Miscellaneous Electrical 32
- Lighting 34
- Lestronic® Charger (page 1) 36
- Lestronic® Charger (page 2) 38
- Signet® Charger 40
- Portable Charger Wiring 40

Batteries 42
Seat Cushions and Deck 44
Mirrors 46
Miscellaneous Frame Components 46
Decals 48
Cab Options 50
Door Options, Steel Cab 52
Door Options, Fiberglass Cab 54
Hydraulic Dump Body Option 56
Rear Cargo Box 58
Top Covers 58
Hitches 60
Ladder Rack Option B2-004-66 and B2-006-78“ 61

Appendixes 1
Appendix A: Special Tools 2
Appendix B: Suggested Torque Limits for Standard Hardware 3
Hardware Identification 3
Standard Head Markings 3
Hex Bolts 3
Other Bolts 3
Hex Nuts 4
Hex Lock Nuts (stover) 4
Other Nuts 4
Suggested Torque Values (non-critical hardware) .. 5
Suggested Torque Values (critical hardware) 6
Appendix C: Brake Lining Handling Precautions 7

B2-48 With Stake Side Dump Bed Option

SC1-00 Stock Chaser

E4-55 Sit Down Tow Tractor

C4-25 Sit Down Tow Tractor

Introduction

Contents

About this manual 2
Who Should Read This Manual 3
Responsibilities 3
How To Use This Manual 4
Conventions 5
How to Identify Your Vehicle 6
B 2-48 and B 2-54 6
BT 2-48 7
BT 2-80 7
Taking Delivery of Your Vehicle 8

ABOUT THIS MANUAL

The purchase of this vehicle shows a belief in high quality products manufactured in the USA. Taylor-Dunn®, a leading manufacturer of electric burden and personnel carriers since 1949, wants to be sure this vehicle provides years of reliable service. Please continue to read this manual and enjoy this high quality Taylor-Dunn® vehicle.

This manual is to serve as a guide for the service, repair, and operation of Taylor-Dunn® vehicles and is not intended as a training guide. Taylor-Dunn® has made every effort to include as much information as possible about the operation and maintenance of this vehicle.

Included in this manual are:

- Vehicle Description
- Safety Rules and Guidelines
- Operational Information
- Operator Responsibilities
- Owner Responsibilities
- Control Operation and Location Information
- Maintenance and Troubleshooting Information
- Standard Parts List

Before servicing, operating, training or performing maintenance on this or any other Taylor-Dunn® vehicle, read the appropriate Taylor-Dunn® manual.

Each Taylor-Dunn® manual references the applicable models and serial numbers on the front cover.

Please, be aware of all cautions, warnings, instructions, and notes contained in this manual.

WHO SHOULD READ THIS MANUAL

This manual is intended for use by anyone who is going to operate, own, perform maintenance on, service, or order parts for this Taylor-Dunn® vehicle. Each person should be familiar with the parts of this manual that apply to their use of this vehicle.

RESPONSIBILITIES

Of the Owner...

The owner of this or any Taylor-Dunn® vehicle is responsible for the overall maintenance and repairs of the vehicle, as well as the training of operators. Owners should keep a record of conducted training and maintenance performed on the vehicle. (OSHA Regulation, 29 CFR 1910.178 Powered Industrial Truck Operator Training).

Of the Operator...

The operator is responsible for the safe operation of the vehicle, preoperational and operational checks on the vehicle, and the reporting of any problems to service and repair personnel.

Of the Service Personnel...

The service personnel are responsible for the service and maintenance of the vehicle. At no time should a service person allow any untrained personnel to service or repair this or any Taylor-Dunn® vehicle. For the purposes of training, a qualified service person may oversee the repairs or services being made to a vehicle by an individual in training. At no time should an untrained individual be allowed to service or repair a vehicle without supervision. This manual is not a training guide.

Of the Passengers ...

The passengers are responsible to remain fully seated, keeping their hands, arms, and legs inside the vehicle at all times. Each passenger should be fully aware of the vehicle's operation. All forms of recklessness are to be avoided. Do not engage in horseplay.

HOW TO USE THIS MANUAL

This manual is organized into five main sections:

INTRODUCTION

This section describes how to use this service manual and how to identify your vehicle.

Safety Rules and Operating Instructions

This section outlines the safety and operational issues, location and operation of controls, and the operational checks that are to be performed on this vehicle. It also includes various subjects that should be included in the operator and service training program.

Maintenance Service and Repair

This section gives specific information on the servicing of the vehicle and a schedule for maintenance checks.

Electrical and Charger Troubleshooting

This section identifies the troubleshooting procedures for testing the electrical system and battery charger.

Illustrated Parts

This section provides an illustrated view of various assemblies. The illustrations are accompanied by tables identifying the parts.

Conventions

Symbols and/or words that are used to define warnings, cautions, instructions, or notes found throughout this manual:

⚠WARNING

or,

⚠WARNING

A shaded box with the word "Warning" on its left denotes a warning. A warning alerts the reader of a hazard that may result in injury to themselves or others. Be sure to follow any instructions contained within a warning and exercise extreme care while performing the task.

⚠CAUTION

The symbol at the left and the bold text contained within a box denotes a "Caution" and is used to inform the reader that property damage may occur. Be sure to exercise special care and follow any instructions contained with in a caution.

NOTE: Alerts the reader to additional information about a subject.

HOW TO IDENTIFY YOUR VEHICLE

This manual applies to vehicles with the same model and serial numbers listed on the front cover.

These vehicles are designed for driving on smooth surfaces in and around facilities such as industrial plants, nurseries, institutions, motels, mobile home parks, and resorts. They are not to be driven on public highways.

This vehicle conforms to requirements for Type E vehicles as described in O.S.H.A. Standard Section 1910.178 (Powered Industrial Trucks) and with all applicable portions of the American National Standard for Personnel and Burden Carriers (ANSI B56.8).

⚠WARNING

Theese vehicles are not designed to be driven on public roads or highways. They are available in maximum designed speeds ranging from 6 to 16 mph. Do not exceed the maximum designed speed. Exceeding the maximum designed speed may result in steering difficulty, motor damage, and/or loss of control. Do not exceed locally imposed speed limits. Do not tow at more than 5 mph.

The locations of the model and serial numbers are illustrated as follows:

TAKING DELIVERY OF YOUR VEHICLE

Inspect the vehicle immediately after delivery. Use the following guidelines to help identify any obvious problems:

- Examine the contents of all packages and accessories that may have come in separate packages with the vehicle.
- Make sure everything listed on the packing slip is there.
- Check that all wire connections, battery cables, and other electrical connections are secure.
- Check battery cells to be sure they are filled.
- Check the tire pressure, tightness of lug nuts, and for any signs of damage.

Check the operation of each of the following controls:

- Accelerator
- Brake
- Parking Brake
- Key-Switch
- Forward/Reverse Switch
- Reverse Beeper (if equipped)
- Front Headlight Switch
- Steering Wheel
- Horn

What To Do If a Problem is Found

If there is a problem or damage as a result of shipping, note the damage or problem on the bill of lading and file a claim with the freight carrier. The claim must be filed within 48 hours of receiving the vehicle and its accessories. Also, notify your Taylor-Dunn® dealer of the claim.

If there is a problem with the operation of the vehicle, DO NOT OPERATE THE VEHICLE. Immediately contact your local Taylor-Dunn® distributor and report the problem. The report must be made within 24 hours of receiving the vehicle and its accessories.

The only personnel authorized to repair, modify, or adjust any part of this or any Taylor-Dunn® vehicle is a factory authorized service technician.

⚠WARNING

The only personnel authorized to repair, modify, or adjust any part of this or any Taylor-Dunn® vehicle is a factory authorized service technician. Repairs made by unauthorized personnel may result in damage to the vehicles systems which could lead to an unsafe condition resulting in severe bodily injury and/or property damage. Unauthorized repairs may also void the vehicles warranty.

B2-48 With Stake Side Dump Bed Option

SC1-00 Stock Chaser

E4-55 Sit Down Tow Tractor

C4-25 Sit Down Tow Tractor

Safety Rules and Operating Instructions

TABLE OF CONTENTS

Standard Specifications 2
Safety Rules and Guidelines 3
Driver Training Program 4
Driver Qualifications. 4
1) Horn Switch 5
2) Forward-Off-Reverse Switch 5
3a) Light Switch 5
3b) Hi-Low Switch 5
4) Combination Display 5
5) Accessory Switches (optional) 5
Vehicle Controls 5
6) Key-Switch 5
7) Emergency Stop Switch 5
Combination Display 6
Accelerator Pedal 7
Foot Brake Pedal 7
Steering 7
Directional Signals (Optional) 7
Hazard Light Switch (Optional) 7
Charger Interlock 8
Seat Interlock Switch 8
Electrolyte Alarm (Optional) 8
Vehicle Operational Guidelines 9
Safety Guidelines 9
Starting: 9
While driving: 9
Loading and Unloading 10
Parking 10
Towing 10
Adjustable Controller Parameters 11
Charging your vehicle 13
New Battery Break in 13
Charging Time 13
Industrial Charger Operation 13
Signet® HB-xxxx Charger Operation 14
Lestronic II® Charger Operation 14
Storing and Returning to Service 15
Storing Your Vehicle 15
Returning to Service 15
Periodic Maintenance Checklist 16
Daily Visual inspection: 17
Maintenance Guidelines for Severe Duty Applications 17

*STANDARD SPECIFICATIONS**

ITEM	Model	SPECIFICATION
Min/Max Battery Weights		169 kg to 261 kg (372 lbs to 576 lbs)
Transmission		Helical Gear, Oil Bath, Automotive Type Hypoid Differential
Brakes		Four Wheel Hydraulic Disc, Automaticaly Applied Park Brake
Steering		Automotive Steering 24:1
Frame		Steel Unitized Body, Heavy Duty 16 Gauge Steel, Diamond Plate
Instrumentation		Combination Display (Battery Status Indicator, Hour Meter, System Status Monitor), Key Switch, Horn Button, Speed select Switch, Forward/Reverse Switch, Headlight Switch, Emergency Stop Switch
Light Accessories		Headlight, Dual Tail/Brake Lights
Charger		Built In 1kW, Automatic AC voltage adjust 120/240 VAC, 13/6.5 Amp, 50 or 60 Hz
Occupancy		2 Passenger
Electrical System	 B 2-48 B 2-54	Eight-244 Amp Hour, 6 Volt, Lead Acid Batteries 350 Amp Solid State Self Diagnostic AC Speed Control 450 Amp Solid State Self Diagnostic AC Speed Control
Dimensions Deck dimensions		307 L X 114 W X 114 H Centimeters 121 L X 45 X 45 H Inches 104.4 W x 191 L Centimeters (41.25 W x 75.25 L Inches)
Turning Radius		350 Centimeters (138 Inches)
Tires	B 2-48 B 2-54	5.70 x 8 Load Range C 18 x 5 x 14 Solid Extra Cushion
Dry Weight Without Batteries		542 kg (1,194 lbs)
Maximum Load	B 2-48 B 2-54	1,360 kg (3,000 pounds) 2,268 kg (5,000 pounds)
Speed Limit (depends on gear ratio installed)	B 2-48 B 2-54	25-kph (16-mph) 13-kph (8-mph)
Motor, AC		3.2 kW, (4.4 hp) for 60 min, 5.1 kW, (6.9 hp) for 5 min

*Specifications are subject to change without notice

These vehicles conform to requirements for Type E vehicles as described in O.S.H.A. Standard Section 1910.178 (Powered Industrial Trucks) and with all applicable portions of the American National Standard for Personnel and Burden Carriers (ANSI B56.8).

SAFETY RULES AND GUIDELINES

It is the responsibility of the owner of this vehicle to assure that the operator understands the various controls and operating characteristics of this vehicle (extracted from the American National Standards Institute Personnel and Burden Carriers ANSI B56.8). As well as, following the safety rules and guidelines outlined in ANSI B56.8 and listed below.

These vehicles are designed for driving on smooth surfaces in and around facilities such as industrial plants, nurseries, institutions, motels, mobile home parks, and resorts. They are not to be driven on public highways.

⚠WARNING

These vehicles are not designed to be driven on public roads or highways. They are available in maximum designed speeds ranging from 6 to 16 mph. Do not exceed the maximum designed speed. Exceeding the maximum designed speed may result in steering difficulty, motor damage, and/or loss of control. Do not exceed locally imposed speed limits. Do not tow this vehicle at more than 5 mph.

⚠WARNING

Read and follow all of the guidelines listed below. Failure to follow these guidelines may result in severe bodily injury and/or property

Refer to ***Vehicle Operational Guidelines, Safety Guidelines*** section for important safety information regarding operating this vehicle.

⚠WARNING

Before working on a vehicle:

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

DRIVER TRAINING PROGRAM

According to ANSI B56.8, the owner of this vehicle shall conduct an Operator Training program for all those who will be operating this vehicle. The training program shall not be condensed for those claiming to have previous vehicle operation experience. Successful completion of the Operator Training program shall be required for all personnel who operate this vehicle.

The Operator Training program shall include the following:

- Operation of this vehicle under circumstances normally associated with your particular environment.
- Emphasis on the safety of cargo and personnel.
- All safety rules contained within this manual.
- Proper operation of all vehicle controls.
- A vehicle operation and driving test.

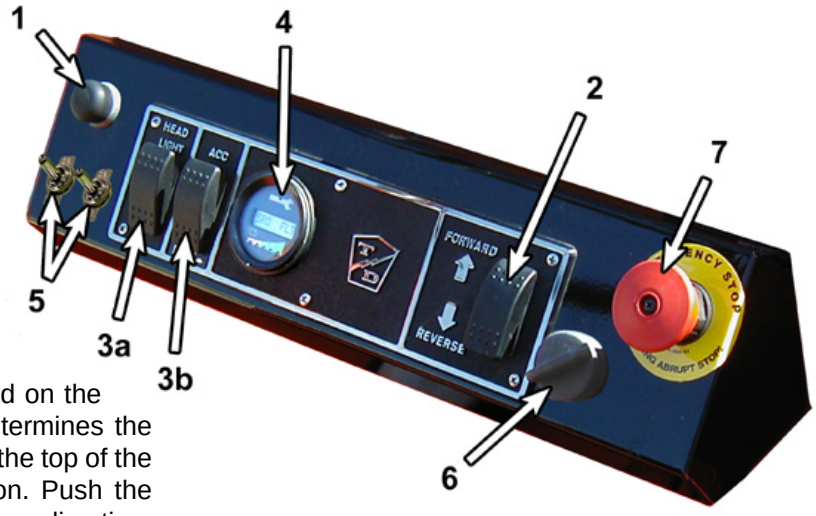
Driver Qualifications.

Only those who have successfully completed the Operator Training program are authorized to drive this vehicle. Operators must possess the visual, auditory, physical, and mental ability to safely operate this vehicle as specified in the American National Standards Institute Controlled Personnel and Burden Carriers ANSI B56.8.

The following are minimum requirements necessary to qualify as an operator of this vehicle:

- Demonstrate a working knowledge of each control.
- Understand all safety rules and guidelines as presented in this manual.
- Know how to properly load and unload cargo.
- Know how to properly park this vehicle.
- Recognize an improperly maintained vehicle.
- Demonstrate ability to handle this vehicle in all conditions.

VEHICLE CONTROLS



1) Horn Switch

The horn switch is located on the right side of the instrument panel. Depress the switch to sound the horn, release it to turn it off.

2) Forward-Off-Reverse Switch

The forward-off-reverse switch, located on the right side of the instrument panel, determines the direction of travel of the vehicle. Push the top of the switch to engage the forward direction. Push the bottom of the switch to engage the reverse direction.

DO NOT SWITCH from forward to reverse or vice-versa while the vehicle is in motion. Make sure the vehicle is completely stopped before shifting.

The forward-off-reverse switch should be in the center "OFF" position, with the key-switch off and the park brake set whenever the operator leaves the vehicle.

3a) Light Switch

The headlight switch is located on the top left of the instrument panel. Push the right side of the switch to turn the lights on. Push the left side of the switch to turn the light off.

3b) Hi-Low Switch

The high-low switch is located on the lower left of the instrument panel. Toggle the switch lever up for normal speed. Toggle the switch lever down for slow speed.

4) Combination Display

Functions for the Combination display are listed on the following pages.

5) Accessory Switches (optional)

The optional accessory switches are located on the left side of the instrument panel. The function of the optional accessory switches will vary depending how the vehicle is equipped.

6) Key-Switch

A key-switch, located on the right center side of the instrument panel, turns on the vehicle. Rotate the key clockwise to turn the vehicle power on, counterclockwise to turn the vehicle power off.

The key-switch should be in the "OFF" position whenever the operator leaves the vehicle.

This switch is also designed to secure and disable the vehicle. The key can only be removed when the key-switch is in the "OFF" position.

7) Emergency Stop Switch

The emergency stop switch will immediately and abruptly stop the vehicle.

The Emergency Stop Switch will stop the vehicle but will still allow some functions to work such as the parking brake bypass switch.

⚠WARNING

Do not depress the Emergency Disconnect Switch while the vehicle is in motion unless the vehicle must be stopped in an emergency. Depressing the switch will immediately apply the park brake, stopping the vehicle. The abrupt stopping of the vehicle may result in severe bodily injury.

Combination Display

The gauge on the dash has many functions. The display will cycle through the functions while the vehicle is in operation. Some functions may not be displayed depending on the current situation of the vehicle.

Hour Meter

Battery Status

Speedometer

Battery Status Indicator-bar graph:

There are five LED's at the bottom of the gauge. Each LED represents an approximate state of charge as listed below:

#5 (far right) LED (green): When on represents 84% to 100% charge remaining.
#4 LED (green): When on represents 68%-84% charge remaining.
#3 LED (green): When on represents 52%-67% charge remaining.
#2 LED (yellow): When on represents 36%-52% charge remaining.
#1 LED (red): When on represents charge 20%-36% remaining. When flashing represents 0%-20% charge remaining.

If the #1 LED is flashing, the vehicle or battery should be immediately removed from service to be recharged. Discharging beyond 20% will damage the battery.

Battery Status Indicator-digital:

Displays total charge remaining in percent. The example to the right indicates that the vehicle has 100% charge remaining (fully charged).

Speedometer:

Indicates the vehicles current rate of travel in miles per hour.

Hour Meter:

Displays total time (whole hours) vehicle has been in operation. Time is accumulated only while the vehicle is moving. The example to the right indicates that the vehicle has been in operation for 2,114 hours.

System Fault Monitor:

The gauge has an alpha numeric display that monitors the system status. If the system detects a fault, an abbreviated fault message will be displayed. Refer to the table below for the abbreviated fault message and description.

Fault Code	Description	Note
CNTL TEMP	Speed controller overheated	3
LOW V	Low battery voltage	
HIGH V	High battery voltage	
CNTL FLT	Speed controller internal fault or wiring fault	1
MOTORTEMP	Motor overheated	3
MOTR FLT	Faulty motor or wiring	1
EB FAULT	Electric brake fault	1
SRO	Operator error	2
STALL	Motor stalled	4

1: Refer repair to a qualified technician.

2: Switched used to operate vehicle may have been selected in the incorrect sequence. Refer to operator instructions in this section.

3: Wait for component to cool. Vehicle may be overloaded.

4: Vehicle overloaded, faulty motor, or possible locked up brakes or transmission. If vehicle is not overloaded, Refer repair to a qualified technician.

Accelerator Pedal

The accelerator pedal is located to the right of the brake pedal. It controls the speed of the vehicle and operates similar to the accelerator pedal in an automobile. Depress the pedal to increase speed and release the pedal to decrease speed.

Foot Brake Pedal

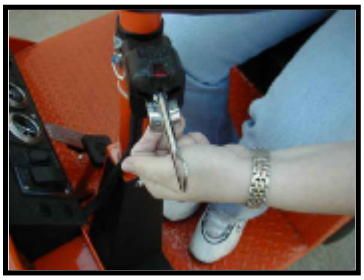
The foot brake pedal, is located to the right of the steering column, it is for operation with the right foot only. It works similar to the brake in an automobile. Applying pressure to the brake pedal slows the vehicle according to the amount of pressure applied. Relieving pressure from the pedal releases the braking action.

Steering

The steering wheel and steering system are similar to an automobile. To turn right, turn the steering wheel clockwise. To turn left, turn the steering wheel counter-clockwise. If equipped with tilt steering, the release lever is located on the lower left of the steering column. Pull the lever up to reposition the steering wheel.

Directional Signals (Optional)

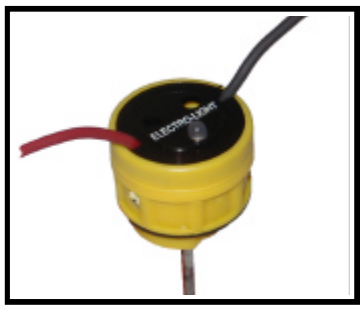
The turn signal lever is located on the left side of the steering column. Push the lever forward to activate the right turn signal and pull the lever back to activate the left turn signal.



Hazard Light Switch (Optional)

The hazard light switch is located on the left side of the steering column. The switch is a small tab. To activate the hazard lights, pull the tab out. To turn the hazard lights off, push forward or pull back the directional signal lever.

Electrolyte Alarm (Optional)



The Electrolyte Alarm is located in the battery area, in the 4th battery cell from the main battery positive cable. The Electrolyte alarm is activated when the battery cell fluid level falls below the level of the probe. The alarm is an audible continuous sound along with a bi-color indicator lamp. Inspect the fluid level in all battery cells when the alarm sounds or the bi-color lamp turns from its green color to red. The vehicle batteries should then be filled and/or charged. With the fluid level at a normal operating level and/or the batteries charged the alarm and light will reset.

Charger Interlock

The charger interlock is designed to disable the vehicle from being driven while the AC charger cord is plugged into a functioning power source.

Seat Interlock Switch

A switch located under the driver's seat disables the power to the vehicle when the driver leaves the seat. The driver must be seated for the vehicle to operate.

Whenever the driver leaves the vehicle, the driver should turn the key-switch off, place the forward-off-reverse switch in the center “OFF” position, and set the park brake.

⚠WARNING

The seat interlock switch is only one part of the vehicle safety system. The interlock switch should not be relied upon as the only safety feature used to disable or disengage this vehicle. Doing so could result in unexpected movement of the vehicle causing severe bodily injury and/or property damage.

VEHICLE OPERATIONAL GUIDELINES

Safety Guidelines

- Only qualified and trained operators may drive this vehicle.
- Drive only on level surfaces or on surfaces having an incline of no more than 10% (5.6 degrees).
- Drive slowly when making a turn, especially if the ground is wet or when driving on an incline.
- This vehicle may overturn easily if turned sharply or when driven at high speeds.
- Observe all traffic regulations and speed limits.
- Keep all body parts (head, arms, legs) inside this vehicle while it is moving.
- Keep the vehicle under control at all times.
- Yield right of way to pedestrians, ambulances, fire trucks, or other vehicles in emergencies.
- Do not overtake another vehicle at intersections, blind spots, or other dangerous locations.
- Do not drive over loose objects, holes, or bumps.
- Yield right of way to pedestrians and emergencies vehicles.
- Stay in your driving lane under normal conditions, maintaining a safe distance from all objects.
- Keep a clear view ahead at all times.

⚠WARNING

Do not get off of the seat while the vehicle is in motion. Getting off of the seat will activate the seat interlock, rapidly slowing the vehicle and applying the park brake. The abrupt slowing of the vehicle may result in severe bodily injury.

Starting:

1. Make sure the forward-off-reverse witch is in the center “OFF” position.
2. Hold down the foot brake.
3. Insert the key and turn it to the “ON” position.
4. Wait 1-second then place the forward-off-reverse switch in the desired direction of travel.
5. Release the foot brake.
6. Slowly depress the accelerator pedal.

While driving:

- Slow down and sound the horn to warn pedestrians or when approaching a corner or other intersection.
- No reckless driving.
- Do not drive this vehicle on steep inclines or where prohibited.
- Immediately report any accidents or vehicle problems to a supervisor.
- Use the low speed model while towing heavy loads. While towing heavy loads, the low speed mode will increase the efficiency of the system and extend running time between charges.

⚠WARNING

Do not turn off the key switch while the vehicle is in motion unless the vehicle must be stopped in an emergency. Turning the key switch off will immediately apply the park brake, stopping the vehicle. The abrupt stopping of the vehicle may result in severe bodily injury.

Loading and Unloading

- Do not carry more than the maximum number of passengers allowed for this vehicle.
- Do not exceed the cargo load capacity.
- Do not load cargo that can fall off.
- Be careful when handling cargo that is longer, wider, or higher than this vehicle, be sure to properly secure all loads.

Parking

Before leaving the vehicle:

- Set the forward-off-reverse switch to the ` "OFF" position.
- Turn the key switch to the "OFF" position and remove the key.
- If equipped with optional hand parking brake, set the park brake.

In addition:

- If parking this vehicle on an incline, turn the wheels to the curb, or block the wheels.
- Do not block fire aisles, emergency equipment, stairways, or exits.

Towing

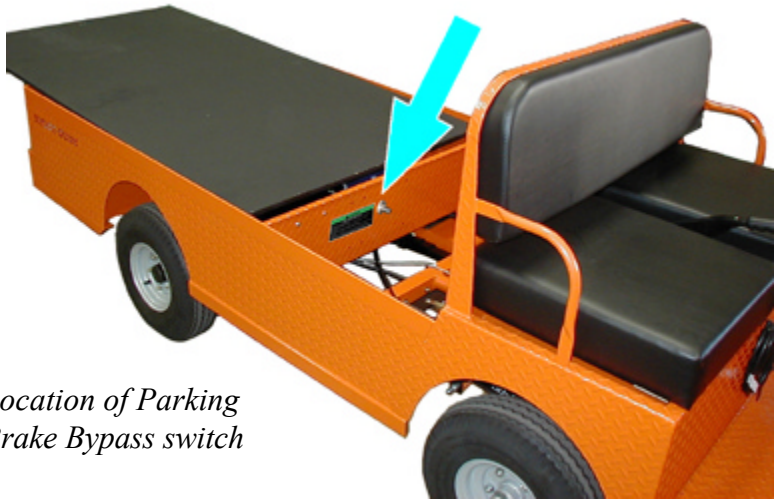
This vehicle is equipped with a standard automatic electric parking brake. The brake is automatically applied when the vehicle is stopped. There is a parking brake bypass switch located on the right side of the control box (see illustration). Place this switch in the UP position to tow the vehicle (see note below). This switch should be in the UP position only while towing the vehicle. The switch should be placed in the DOWN position immediately after the towing is completed. Leaving the switch in the UP position will discharge the battery.

To tow this vehicle, attach a tow strap to the front bumper tow-bar.

Use another driver to steer this vehicle while it is being towed. Be sure the driver uses the brakes when the towing vehicle slows or stops. Do not tow the vehicle faster than 5 m.p.h. or its maximum designed speed, whichever is lower.

If at all possible, this vehicle should be placed on a carrier, rather than towing.

NOTE: The automatic electric brake is powered by the vehicles battery. The brake may not disengage if the battery is severely discharged. A battery must be installed to tow the vehicle.



Location of Parking Brake Bypass switch

Adjustable Controller Parameters

⚠WARNING

Improper programming may cause unexpected operation of the vehicle and/or damage the electrical components. This could result in severe bodily injury and/or property damage

A limited number of controller parameters can be adjusted by your dealer. The values of these parameters will vary depending on the vehicle model and/or configuration.

A list of the adjustable parameters and their function is listed on the following pages along with their typical default factory settings.

Default factory settings are subject to change without notice. It is highly recommended that you record current settings in the controller before making any adjustments.

* - The Maintenance Meter Function is optional. When equipped, the Maintenance Meter Function will notify the operator when a scheculed maintenance is due. Refer to the supplementary Maintenance Meter manual for more information.

Speed Calculation Formulas:

RPM = (20172 / T_d) * (MPH / 60) * R

RPM = (31837 / T_d) * (KPH / 60) * R

Where:

***RPM** = motor RPM*

***T_d** = Tire diameter (inches or cm)*

***MPH** = Miles Per Hour*

***KPH** = Kilometers per hour*

***R** = Rear axle ratio*

⚠WARNING

Do not increase the governed speed RPM beyond the maximum recommended speed of the vehicle. Exceeding the maximum recommended speed of the vehicle may result in loss of control and severe bodily injury or property damage.

Refer to Vehicle Specifications for vehicle speed limit.

Model # B 2-48 equipped with 18:1 drive ratio			
Aceleration Parameters (normal mode)			
Function	Value	Unit	Description
FwdAS LS	**3.5**	S	Time to accelerate to ~15% of full speed
FwdAc HS	**4.0**	S	Time to accelerate to full speed
RevAc LS	**10.0**	S	Time to accelerate to from FwdAC LS to full
RevAc HS	**8.0**	S	Time to accelerate to full speed
Aceleration Parameters (low speed mode)			
FwdAS LS	**4.0**	S	Time to accelerate to ~15% of full speed
FwdAc HS	**5.5**	S	Time to accelerate to full speed
RevAc LS	**10.0**	S	Time to accelerate to from FwdAC LS to full
RevAc HS	**10.0**	S	Time to accelerate to full speed
Deceleration Settings			
Brake Multplier	**40**	%	Brake regen multiplier is activated by the brake switch
Normal Decl HS	**9.0**	S	Time to decelerate to 0 when above 20% of full speed
Normal Decl LS	**12.0**	S	Time to decelerate when below 20% of full speed
Tow Decl HS	**8.5**	S	Time to decelerate to 0 when above 20% of full speed
Tow Decl LS	**8.0**	S	Time to decelerate when below 20% of full speed
Maintenance Meter Function			
Service Timer	**0***	H	Refer to Maintenance Meter supplementary manual
Speed Limits			
Max (see warning)	**6,250**	RPM	Governed speed (see formula)
Tow (optional)	**62**	%	Percentage of Max speed when Tow Switch is ON
Rev	**45**	%	Percentage of Max speed when in reverse
Low Batt	**40**	%	Percentage of Max speed when low battery warning is ON
Service Due	**20***	%	Percentage of Max speed when service is due. See maintenance Meter Function
Batery Characteristics			
Full Volts	**2.165**	V	Battery must exceed this voltage to be considered fully charged
Empty Volts	**1.730**	V	Voltage of a fully discharged battery
BDI Level for Batt Spd	**15**	%	Low battery warning is ON when battery is discharged below this level
BDI Reset %	**80**	%	Battery must be discharged below this value before the BDI will be allowed to reset
Reset Volts	**2.10**	V	Battery voltage must be above this value to reset the BDI. Modified by the 'BDI Reset %' above)
Discharge Time	**60**	M	Estimated battery discharge rate
Miscellaneous			
SRO Min Speed	**3,000**	RPM	Motor must be below this RPM to change directions with the throttle pedal depressed

Model # B 2-48 / B 2-54 equipped with 30:1 drive ratio			
Aceleration Parameters (normal mode)			
Function	Value	Unit	Description
FwdAS LS	**2.6**	S	Time to accelerate to ~15% of full speed
FwdAc HS	**4.0**	S	Time to accelerate to full speed
RevAc LS	**8.0**	S	Time to accelerate to from FwdAC LS to full
RevAc HS	**7.0**	S	Time to accelerate to full speed
Aceleration Parameters (low speed mode)			
FwdAS LS	**4.0**	S	Time to accelerate to ~15% of full speed
FwdAc HS	**5.5**	S	Time to accelerate to full speed
RevAc LS	**8.0**	S	Time to accelerate to from FwdAC LS to full
RevAc HS	**7.0**	S	Time to accelerate to full speed
Deceleration Settings			
Brake Multplier	**40**	%	Brake regen multiplier is activated by the brake switch
Normal Decl HS	**8.0**	S	Time to decelerate to 0 when above 20% of full speed
Normal Decl LS	**10.0**	S	Time to decelerate when below 20% of full speed
Tow Decl HS	**8.5**	S	Time to decelerate to 0 when above 20% of full speed
Tow Decl LS	**8.0**	S	Time to decelerate when below 20% of full speed
Maintenance Meter Function			
Service Timer	**0***	H	Refer to Maintenance Meter supplementary manual
Speed Limits			
Max	**6,250**	RPM	Governed speed (see formula below)
Tow (optional)	**60**	%	Percentage of Max speed when Tow Switch is ON
Rev	**45**	%	Percentage of Max speed when in reverse
Low Batt	**40**	%	Percentage of Max speed when low battery warning is ON
Service Due	**20**	%	Percentage of Max speed when service is due. See maintenance Meter Function
Batery Characteristics			
Full Volts	**2.165**	V	Battery must exceed this voltage to be considered fully charged
Empty Volts	**1.730**	V	Voltage of a fully discharged battery
BDI Level for Batt Spd	**15**	%	Low battery warning is ON when battery is discharged below this level
BDI Reset %	**80**	%	Battery must be discharged below this value before the BDI will be allowed to reset
Reset Volts	**2.1**	V	Battery voltage must be above this value to reset the BDI. Modified by the 'BDI Reset %' above)
Discharge Time	**60**	M	Estimated battery discharge rate
Miscellaneous			
SRO Min Speed	**3,000**	RPM	Motor must be below this RPM to change directions with the throttle pedal depressed

CHARGING YOUR VEHICLE

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠CAUTION

The key switch must be in the "OFF" position when charging the batteries. Failure to turn the key switch "OFF" may result in damage to the vehicles electrical system.

New Battery Break in

New batteries require a break in period of up to 40-cycles. The batteries will not have their full capacity during this break in period and may require longer charging times.

Charging Time

Average charging time is 8 to 12-hours. The time required to fully charge your batteries will vary depending on:

- Capacity of the batteries, higher capacity requires longer charge time.
- Output of the charger, higher output requires less charge time.
- Depth of discharge, the deeper a battery is discharged, the longer it takes to charge.
- Temperature, low temperatures require longer charge time.

It is not unusual for charge times to exceed 15-hours, especially with new batteries.

Industrial Charger Operation

If equipped with an industrial charger, it is either specified by or provided by the end user. Refer to the operating instruction supplied with your charger or contact the charger manufacturer for more information.

Signet® HB-xxxx Charger Operation

Typical Signet® Built In Charger

The Signet® HB-600 and HB-1000 chargers use a semiautomatic charging system. The charger will turn itself ON when the AC power cord is connected to the AC power source and turn itself OFF when the batteries are fully charged. Refer to the data plate on the charger for the voltage and power type required for the charger.

The charger has a series of LED's on the face plate that will display the current status of the charger and charging cycle. The location and layout of the status LED's will vary depending on age of the charger. Flashing LED's and a beeping sound from the charger indicate a fault in the charging system., see below.

Charging State	LED1	LED2	LED3
0 to 50%	FLASHING	OFF	OFF
50% to 75%	ON	FLASHING	OFF
75% to 100%	ON	ON	FLASHING
Cycle complete	ON	ON	ON
Fault, exceeded time out	OFF	OFF	FLASHING
Fault, see troubleshooting	FLASHING	FLASHING	FLASHING

When the charger is plugged in, the charger status LED's will go through a start-up sequence. During the start-up, the charger is performing a self test and system voltage check. After about 10-seconds the charger will start and the LED's will display the current charging status. **Do not disconnect the charger during the start-up period.**

If the LED's do not turn on when the charger is plugged in, then there may be a problem with the AC line voltage or the charger has failed. Refer testing of the charging system to a qualified technician.

After the start-up sequence, if all the LED's are flashing then the charger has found a fault in the charging system. Refer testing of the charging system to a qualified technician.

After a charging cycle, if the LED's are flashing then the charger found a fault during the charging cycle. Refer testing of the charging system to a qualified technician.

Typical charging times are eight to twelve hours depending on the how deep the batteries are discharged. The charger has an internal timer that will terminate the charge cycle if the batteries are not fully charged within a preset time limit. If this occurs, the charger will report a fault of running too long. The most likely cause of this fault is defective batteries. Refer testing of the batteries to a qualified technician.

Lestronic II® Charger Operation

Typical Lestronic II® Built In Charger

The Lestronic II® charger is a semiautomatic charging system. The charger will turn itself ON when the AC power cord is connected to the AC power source and turn itself OFF when the batteries are fully charged. Refer to the data plate on the charger for the voltage and type power required for the charger.

When the charger is plugged in, it should turn on within a few seconds. To determine if the charger is on, listen for a humming sound from the charger. If the charger does not turn on, then there may be a fault in the AC line voltage or in the charger. Refer troubleshooting to a qualified technician.

Typical charging times are eight to twelve hours depending on the how deep the batteries are discharged. Charging times exceeding 16-hours may be a result of faulty batteries, faulty charger, noisy or fluctuating AC line voltage, or momentarily interrupting the charging cycle. Refer troubleshooting to a qualified technician.

To obtain the maximum battery life:

Charge the batteries only after they reach a normal discharge as indicated on the Battery Status Indicator (BSI). Failure to follow this guideline could result in the batteries entering an overcharge state, which will reduce the life of the batteries. If you find it necessary to charge the batteries before they are completely discharged we recommend waiting until they are discharged a minimum of 25% to reduce the possibility of overcharging. Refer to Vehicle Controls in this section for information on how to read the BSI.

Do not discharge the batteries beyond a normal discharge as indicated on the BSI. Refer to Vehicle Controls in this section for information on how to read the BSI.

Check the battery electrolyte once a week. Do not charge the batteries if the battery electrolyte is low. Charging when the electrolyte is low will damage the batteries and shorten their life-span. Only authorized personnel should perform battery maintenance including maintaining the battery electrolyte level. Refer to Section ***Maintenance, Service and Repair*** for battery maintenance information.

Do not interrupt the charging cycle. When the charger is plugged in, allow it to turn off before disconnecting. Interrupting the charging cycle could lead to overcharging or discharging the batteries too deep. Both circumstances will shorten the life of the batteries.

STORING AND RETURNING TO SERVICE

Both storing your vehicle and returning it to service should only be performed by authorized personnel.

Storing Your Vehicle

- Clean the batteries, then fill and charge before putting the vehicle in storage. Do not store batteries in a discharged condition.
- Lube all grease fittings.
- Clean, dry, and check all exposed electrical connections.
- Inflate tires to proper pressure (if applicable).
- For extended storage, the vehicle should be elevated so that the tires do not touch the ground.

If stored for a prolonged period, the batteries should be charged per the table to the right.

Storage Temperature (F)	Charging Interval (months)
Over 60	1
Between 40 and 60	2
Below 40	6

Returning to Service

- Check the battery's state of charge and charge if required.
- Perform ALL maintenance checks in the periodic checklist.
- Remove any blocks from the vehicle and/or place the vehicle down on to the ground.
- Test drive before putting into normal service.

PERIODIC MAINTENANCE CHECKLIST

Taylor-Dunn
Preventative Maintenance Schedule for GT Drive with AC Motor

Date: _____ Model #: _____ Hour Meter: _____
Inspected By: _____ Serial #: _____
Serviced By: _____ Unit ID#: _____

Interval (hours)[1]	Inspected[2]	Service Required	Service Complete	Item Description
Operator Daily Checklist				Master cylinder fluid level
				Parking brake for secure hold
				Battery water level
				Tire inflation (pneumatic tires)
				Tire tread / damage
				All lights (head, tail, brake, warning, dash panel)
				Steering (hard steering, excessive play, unusual noises)
				Inspect brake and throttle pedal (play, binding, noise)
				Horn
				Motion alarm (if equipped)
				Fluid leaks (brakes, rear axle, battery, hydraulic system)
500				Adjust service and park brake systems
				Inspect all steering linkages and hardware
				Tighten steering shaft to steering gear coupler (if equipped)
				Lubricate the vehicle
				Wash batteries and clean terminals
				Inspect for fluid leaks
				Check all electrical interlocks for proper operation
				Inspect wheel bearings for play and noise
				Inspect front fork collar bearings for play and noise (3-wheel vehicle only)
				Inspect and tighten all hardware (first 500 hours only, then 1000 hours and every 1000 hours)
1000				Inspect and tighten all hardware
				Clean and repack front wheel bearings, replace grease seals
				Inspect and clean brake dust from electric motor brake
				Inspect all electrical connections for signs of overheating
				Tighten all electrical connections
				Inspect all wiring for cracks, fraying or wear
				Clean and lubricate motor coupler
				Inspect steering king pins for play
				Align front end
2000				Change rear axle oil
				Flush hydraulic brake system
				Inspect suspension bushings (spring, shock)
				Inspect suspension bumpers
				Replace brake pedal/treadle return spring
				Inspect frame for damage

Notes (1) and (2), Refer to "Maintenance Guidelines for Severe Duty" in the vehicles service manual

Form PM-0002 GT Drive / AC Motor, Revision B
08/25/2006

NOTE: A full page copy of the Periodic Maintenance Checklist is on the Vehicle Documentation CD under the [Misc] sub folder.

Daily Visual inspection:

Tire condition and pressure.

External frame damage (body).

Operation of all lights and warning alarms and/or horns.

Smooth and proper operation of all controls such as but not limited to:

- Accelerator pedal, Brake pedal, Steering, Parking brake, etc.
- Proper operation of all locking devises such as but not limited to:

  Tool box, Removable battery trays, Cargo box, Cab doors, etc.
- Proper operation of all interlocking switches such as but not limited to:
- Key switch, Seat interlock switch, Charger interlock switch, etc.

Inspect for leaking fluids or grease.

MAINTENANCE GUIDELINES FOR SEVERE DUTY APPLICATIONS

1. This maintenance checklist is based on the average application. If the vehicle is operated under "severe conditions", service procedures should be conducted more frequently than specified. The frequency of service under severe conditions is determined by the use of the vehicle. The owner/ operator must evaluate the operating environment to determine the increase in maintenance frequency.

In addition, the whole vehicle should be inspected monthly for signs of damage. The damage must be repaired immediately.

The following list is meant as a guide and is not all-inclusive of a "severe duty" application.

- Extreme temperature.
- Bumpy, dusty, or ill maintained roads.
- Excessively wet areas.
- Corrosive or contaminated areas.
- Frequent loading of vehicle at/near capacity.
- Use on multiple shifts.

2. Any deficiencies found during an inspection should corrected before the vehicle is returned to service.
3. Battery water level should be inspected on a weekly schedule.

⚠WARNING

Only properly trained and authorized technicians should perform maintenance or repairs to this vehicle. Repairs or maintenance by improperly trained or unauthorized personnel could cause improper operation of the vehicle or premature failure of components resulting in severe bodily injury and/or property damage.

TAYLOR - DUNN

General Maintenance

TABLE OF CONTENTS

Maintenance Guidelines 2
Troubleshooting Guide 3
Lubrication Chart 4

MAINTENANCE GUIDELINES

⚠WARNING

Periodic maintenance and service must be performed on this vehicle. Failure to complete these scheduled maintenance and service procedures can result in severe bodily injury and/or property damage. It is the owner and/or operators responsibility to insure that proper service and maintenance is performed on the vehicle, described in this manual.

⚠WARNING

Before starting any repairs:

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

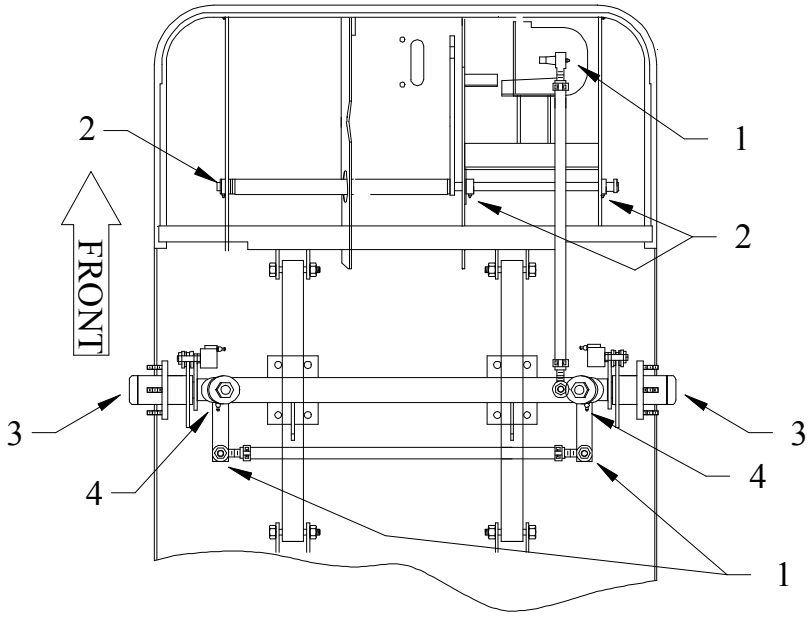
Read and follow all of the guidelines listed below. Failure to follow these guidelines may result in severe bodily injury and/or property damage.

- Avoid fire hazards and have fire protection equipment present in the work area. Conduct vehicle performance checks in an authorized area where safe clearance exists.
- Before starting the vehicle, follow the recommended safety procedures in Section 2, "Safety Rules and Operational Information."
- Ventilate the work area properly.
- Regularly inspect and maintain in a safe working condition, brakes, steering mechanisms, speed and directional control mechanisms, warning devices, lights, governors, guards, and safety devices.
- Inspect and maintain battery limit switches, protective devices, electrical conductors, and connections in conformance with Taylor-Dunn's® recommended procedures.
- Keep the vehicle in clean condition to minimize fire hazards and facilitate detection of loose or defective parts.
- Do not use an open flame to check level or leakage of battery electrolyte.
- Do not use open pans of fuel or flammable fluids for cleaning parts.
- Only properly trained and authorized technicians should perform maintenance or repairs to this vehicle.

TROUBLESHOOTING GUIDE

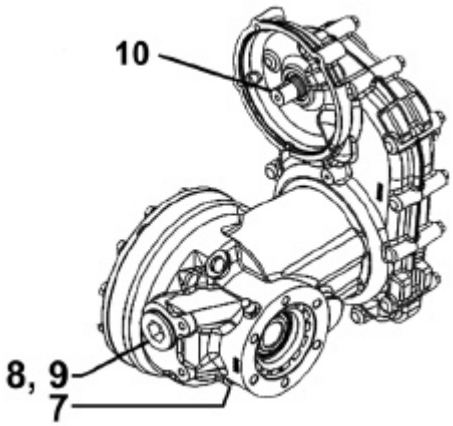
Symptom	Probable Cause
Steering Pulls in One Direction	Front End Out of Alignment
	Low Tire Pressure
Hard Steering	Dry Lube Points in Steering Linkage
	Damaged King Pin/Ball Joint
	Low Tire Pressure
Excessive Steering Play	Worn Ball Joints
	Mis-Adjusted or Worn Steering Gear
	Loose Steering Linkage
Lack of Power or Slow Operation	Brakes or Parking Brakes Dragging
	Worn Drive Gears
	Front End Out of Alignment
	Speed Control System Fault
	Speed Control System Overheated
	High/Low Speed Switch in Low or wiring to the Switch is Faulty
	Low Speed Cutback Due to Maintenance Meter Trip (optional)
Abnormal Noise	Worn Drive Gears or Bearings
	Worn Front /Rear Axle Bearings
	Loose Lug Nuts
	Motor Bearings Worn
Oil Leak in Rear Bearing Area	Rear Wheel Bearing and/or Gasket Failed
	Drive Over Filled
Brake Pedal Soft or Spongy	Air in Brake Lines
Brake Pedal Low	Brake Worn (1/16" Wear Limit)
	Brake Fluid Low
	Brakes Out of Adjustment
Braking Power Low	Brake Worn (1/16" Wear Limit)
	Brake Pads Contaminated with Fluid
	Brake Pedal Linkage Binding
	Brakes Out of Adjustment
	Air in Brake Lines
	Trailer Brake System Faulty (optional)

LUBRICATION CHART



Front End Lubrication

Rear Axle Lubrication



#	Description	Locations	Lubricant Type
1	Ball Joints	4	General Purpose Grease
2	Pedal Linkages	3	General Purpose Grease
3	Front Wheel Bearings	2	High Temperature Wheel Bearing Grease
4	King Pin	2	General Purpose Grease
7	Drive Drain Plug	1	
8	Drive Level Plug	1	
9	Drive Fill Plug	1	SAE 80W90 Gear Oil
10	Motor Coupler		Part Number 94-421-34, Moly Paste Grease

Front Axle Service

TABLE OF CONTENTS

Inspect the Front Wheel Bearings and King Pin 2
Adjust Front Wheel Bearings 3
Front Axle Removal and Installation 4
Removal 4
Installation 5
Front Axle Disassembly 6
Replace Front Wheel Bearings 7
Replace the King Pins and Bushings 9
Replace the Steering Knuckle 11

INSPECT THE FRONT WHEEL BEARINGS AND KING PIN

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Grab the top and bottom of the tire/wheel assembly. Feel for any movement or play while pulling and pushing on the top and bottom of the tire. Any movement or play is an indication of loose wheel bearings or king pin.

NOTE: Refer to the **Adjust Front Wheel Bearings** *section for information regarding the adjustment of the wheel bearings.*

NOTE: If the king pin is loose, then refer to **Replace the King Pins and Bushings** *for information regarding replacing the king pin bushings. There are no adjustments for the king pin or bushings.*

8. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.

NOTE: Refer to the **Replace Front Wheel Bearings** *section for information regarding the replacement of the wheel bearings.*

9. Lower the vehicle.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels.
12. Release the park brake and test drive the vehicle.

ADJUST FRONT WHEEL BEARINGS

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

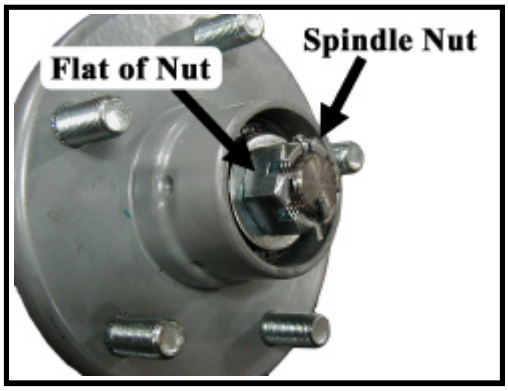
6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the hub dust cap and cotter pin.
8. While rotating the hub, tighten the spindle nut to 30 ft-lbs. This seats the bearings.
9. Back off the spindle nut one flat until the hub turns, but is not loose.
10. Spin the wheel and listen for any grinding noise. Any grinding noise may be an indication of worn or damaged wheel bearings.

    NOTE: Refer to the **Replace Front Wheel Bearings** *section for information regarding the replacement of the wheel bearings.*



Hub with Dust Cap Removed

11. Install a new cotter pin.
12. Install the dust cap.
13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

FRONT AXLE REMOVAL AND INSTALLATION

Removal

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

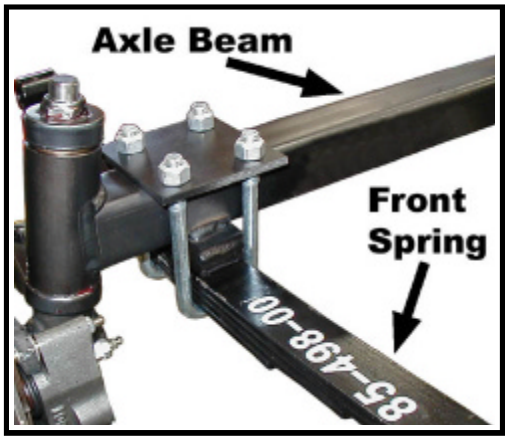
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove both front wheels. Refer to ***Tires and Wheels*** section for information regarding removing the front wheels.
8. Tie up or support the front axle so it can not fall out of the vehicle.
9. Disconnect the drag link ball joint or rod end from the steering knuckle or the steering gear pitman arm.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

10. If equipped with front brakes, disconnect the hydraulic brake lines from the brake bodies.
11. Disconnect the front axle beam from the front springs and remove the axle from the vehicle.

    NOTE: In some configurations the front springs and or shocks will have to be removed in order to remove the axle beam. Refer to section **Front Suspension** *for information regarding removing the springs and shocks.*



Installation

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Install the front axle in reverse order of removal.

   NOTE: Use all new cotter pins.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the installing the ball joints or rod ends.*

   NOTE: Refer to **Tires and Wheels** *section for information regarding removing the front wheels.*

8. Realign the front wheels. Refer to ***Steering Component Service*** section for information regarding realigning the front wheels.
9. If equipped with front brakes, bleed the brakes. Refer to ***Brake Service*** section for information regarding bleeding the brakes.
10. Lower the vehicle.
11. Reconnect the main positive and negative cables at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the park brake and test drive the vehicle.

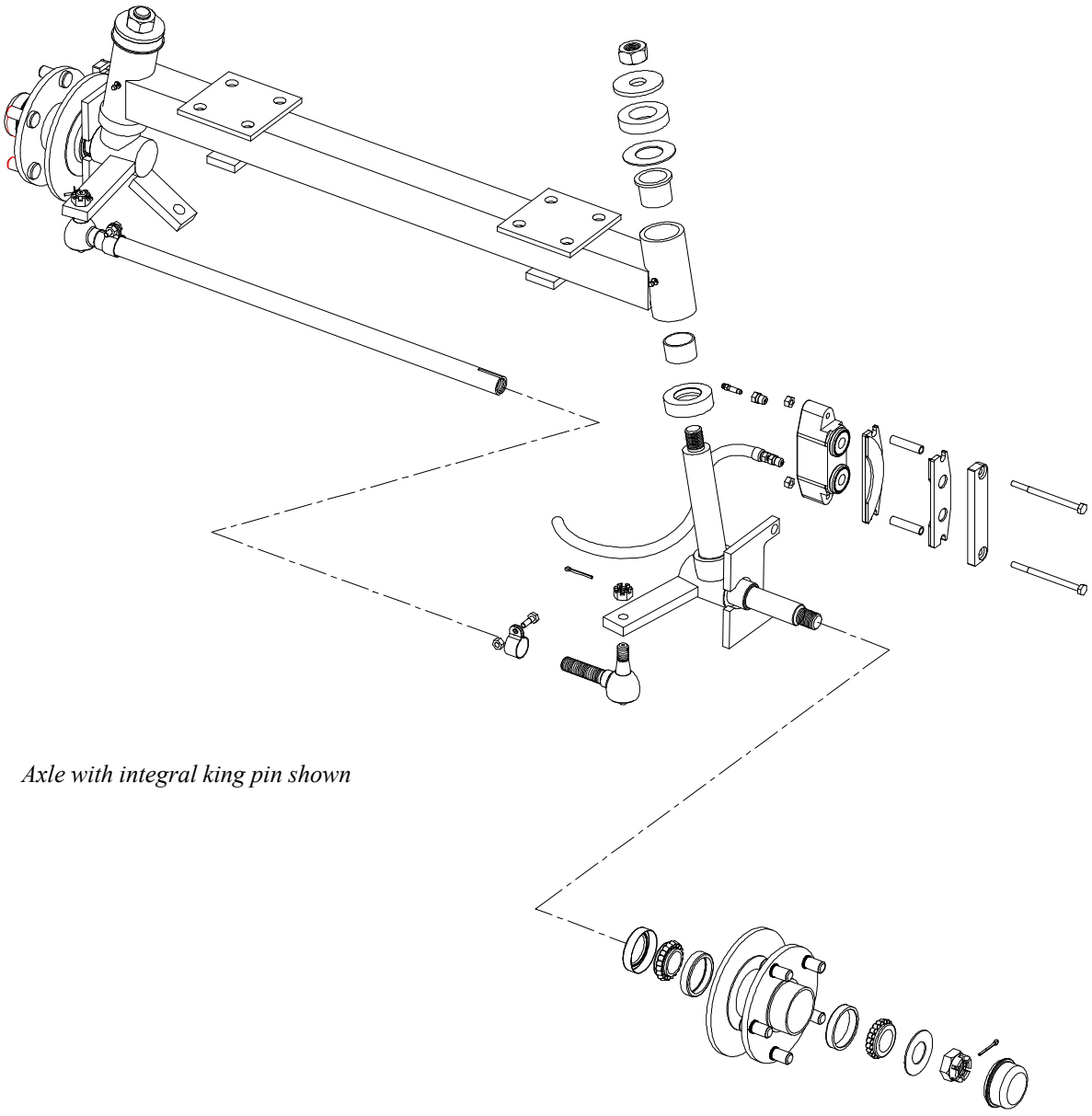
FRONT AXLE DISASSEMBLY

Disassembling and reassembling involves removing and replacing the left and right steering knuckles and king pin bushings. Refer to the following sections for information regarding these procedures:

Replace the Steering Knuckle

Replace the King Pins and Bushings

NOTE: The front axle does not have to be removed unless the axle beam must be replaced. Refer to **Front Axle Removal and Installation** *for information regarding removing the front axle.*



Axle with integral king pin shown

REPLACE FRONT WHEEL BEARINGS

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

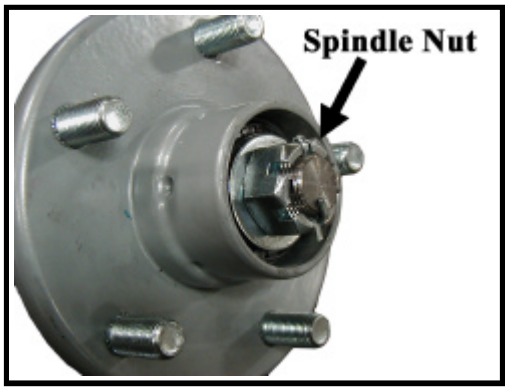
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the tire/wheel assembly from the hub. Refer to ***Replace the Steering Knuckle*** for information regarding removing the steering knuckle.
8. Remove the hub dust cap, cotter pin, and spindle nut.
9. Remove the hub from the steering knuckle.

   NOTE: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** *section for information regarding the removal of the brake body.*

   NOTE: Catch the outer bearing as it falls out.

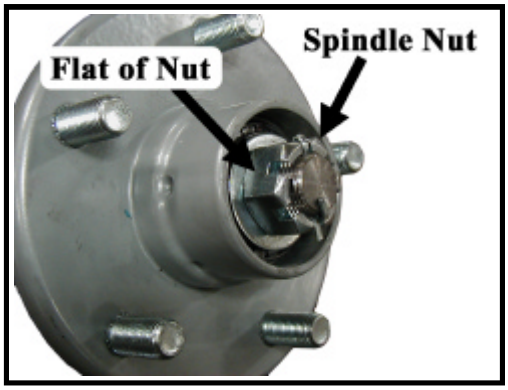


Hub with Dust Cap Removed

10. Thoroughly clean all grease from the inside of the hub and the bearings.
11. Inspect and replace the races and bearings as a set.

    NOTE: It is recommended to replace all four bearings and races in the left and right wheels as a set.

12. Assemble in reverse order, using new grease seals.
    a. Pack inner and outer bearings with grease.
    b. While rotating the hub, tighten the spindle nut to 30 ft-lbs. This seats the bearings.
    c. Back off the spindle nut one flat until the hub turns, but is not loose.
    d. Install a new cotter pin.



Hub with Dust Cap Removed

13. Install the hub dust cap.
14. Reinstall the brake body and the tire/wheel assembly.

    NOTE: Refer to the **Brakes** *section for information regarding the installation of the brake body.*

15. Lower the vehicle.
16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.

REPLACE THE KING PINS AND BUSHINGS

There are different types of king pin bushings depending on the configuration of your vehicle.

- Bronze bushings in the axle beam.
- Bronze bushings in the steering knuckle.
- Metal backed teflon bushings in the axle beam or suspension arm.

NOTE: Bronze bushings must be reamed or broached to the proper diameter after they are pressed into the axle beam or steering knuckle.

⚠WARNING

Failure to correctly broach or ream bronze bushings may result in steering difficulty and loss of control of the vehicle causing severe bodily injury and /or property damage.

Refer to the illustration below for the type of bushing in your vehicle.

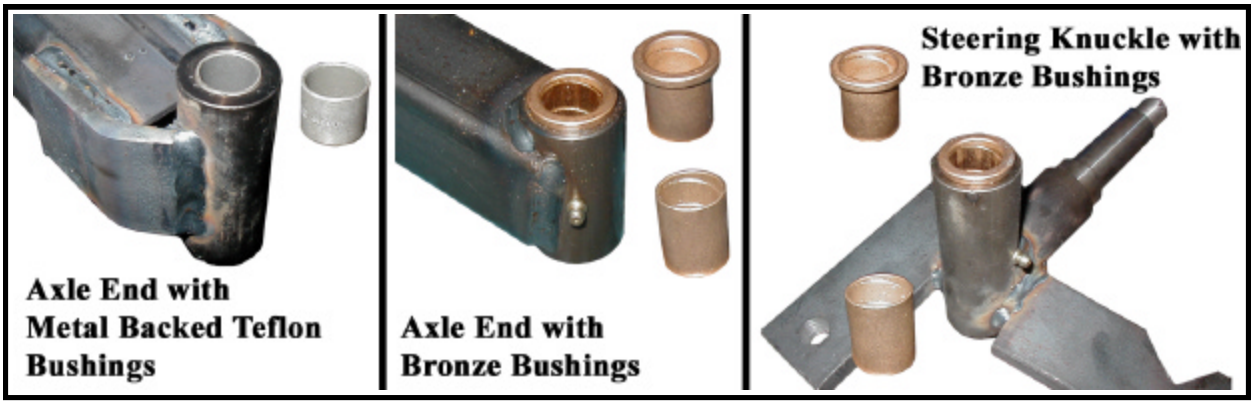
⚠WARNING

1. **Make sure the ON-OFF switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.



7. Remove the steering knuckle. Refer to ***Replace the Steering Knuckle*** for information regarding removing the steering knuckle.

   NOTE: It is not necessary to remove the tie rod or drag link for this procedure.

8. Press the king pin bushings out from the axle, steering knuckle or suspension arm.
9. Press new bushings into the axle, steering knuckle or suspension arm. Ream or broach bronze bushings to 1.25" +/- 0.001".

⚠WARNING **Failure to correctly broach or ream bronze bushings may result in steering difficulty and loss of control of the vehicle causing severe bodily injury and/or property damage.**

10. Inspect the king pin for damage or wear. If any damage or wear is noted then the king pin must be replaced.
11. Reassemble in reverse order.

    *NOTE: Refer to **Replace the Steering Knuckle** for information on installing the steering knuckle.*

    NOTE: It is recommended that the thrust washers or bearing be replaced whenever replacing the king pin bushings. Refer to the **Replacement Parts** *section for the orientation of the bearing or washers in your vehicle.*

12. Grease the bushings (bronze only).
13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

REPLACE THE STEERING KNUCKLE

⚠WARNING

1. **Make sure the ON-OFF switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

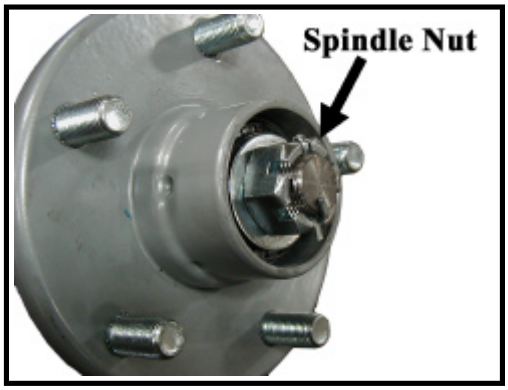
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

6. Raise the front of the vehicle and support with jack stands.
7. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information regarding removing the tire/wheel assembly.
8. Remove the hub bearing cap, cotter pin and nut, then remove the hub from the steering knuckle.

   NOTE: For a front disc brake option you must remove the brake body before removing the hub. Refer to the **Brakes** *section for information regarding the removal of the brake body. Do not remove the hydraulic brake line from the brake body. If the brake line is removed then it will be necessary to bleed the brakes.*

   NOTE: Catch the outer bearing as it falls out.



Hub with Dust Cap Removed

9. Remove the drag link and/or tie rod from the steering knuckle. Refer to ***Replace the Ball Joints, Tie Rods, Drag Link*** in this section for information regarding removal of the drag link or tie rod.
10. While supporting the knuckle, remove the king pin and thrust bearing.
11. Remove the knuckle from the axle.

12. Thoroughly clean and/or replace all bearings, nuts, washers, and bushings.

    NOTE: Both the left and right side bushings and thrust bearings should be replaced as a set.

13. Assemble in reverse order.
14. Pack the thrust bearing with grease.
15. Tighten the king pin nut until all of the up and down play is removed and the yoke rotates freely. The rubber washer must compress slightly to create a seal for the grease.

    NOTE: Refer to **Replace Front Wheel Bearings** *for information regarding proper tightening of the spindle nut*

16. Install new cotter pins.
17. Realign the wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

18. Lower the vehicle.
19. Reconnect the main positive and negative cables at the batteries.
20. Remove the blocks from behind the wheels.
21. Release the park brake and test drive the vehicle.

Steering Component Service

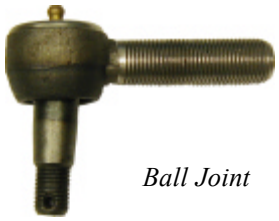
TABLE OF CONTENTS

Front End Alignment 2
Inspect Ball Joints 6
Inspect Rod Ends 7
Adjust the Steering Gear 8
Replace the Steering Shaft 10
Replace the Steering Wheel 12
Replace the Steering Gear 13
Replace the Ball Joints, Tie Rods, and Drag Link 14
Replacing the Drag Link 16
Replacing the Tie Rod 17
Center the Steering Gear 18
Pitman Shaft Alignment 18
Repair the Steering Gear 19
Exploded View of Steering Gear 22

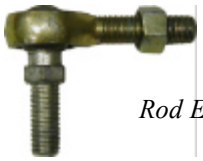
FRONT END ALIGNMENT

This section will refer to two different types of ball joints. One type is has a grease fitting and a tapered shaft where it is fitted to the steering arm or pitman arm. The second type cannot be greased and has a straight shaft. See the illustrations to the right. Depending on the configuration of your truck, it may be equipped with one or both types of ball joints.

In this text:
The first type has a grease fitting and will be referred to as a "Ball Joint."
The second type has no grease fitting and will be referred to as a "Rod End."



Ball Joint



Rod End

Center the Steering

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Turn the front wheels so that they are in the straight ahead position and then tie off the wheels so that they cannot turn from the straight ahead position.
8. Disconnect the drag link from the pitman arm.

   NOTE: Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint or rod end from the drag link.*

9. Center the steering gear and tie off the steering wheel so that it cannot rotate.

   NOTE: Refer to **Center the Steering Gear** *section for information regarding centering of the steering gear.*

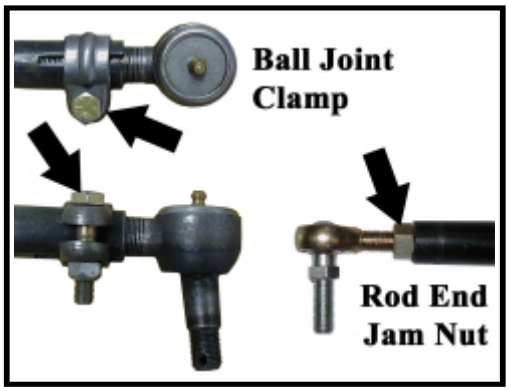
10. At this point both the steering wheel ***and*** the front wheels should be tied up and held in position. If one or the other is not tied up then you must start from the beginning.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in the position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

11. Loosen the ball joint clamps or the rod end jam nuts on the drag link.

    NOTE: Remember the position and orientation of the clamps.



12. Adjust the drag link so that it can be easily inserted into the pitman arm.
13. Tighten the ball joint or rod end nut as specified below:
    Ball joint - 40-45 ft-lbs.
    Rod end - 20-25 ft-lbs.
14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.
15. Tighten the ball joint clamps (28-32 ft. lbs.) or the rod end jam nuts on the drag link.
16. Untie the steering wheel and the front wheels.
17. Reconnect the main positive and negative cables at the batteries.
18. Rotate the steering wheel from a full left turn to a full right turn and make sure that the ball joint clamps do not contact any other component.

⚠WARNING

If the clamps are positioned so that they contact other components, it may result in steering failure and loss of control of the vehicle causing property damage and/or severe bodily injury.

19. Remove the blocks from behind the wheels.
20. Release the parking brake and test drive the vehicle.

Front wheel alignment

NOTE: It is recommended to center the steering before aligning the front wheels. Refer to the **Center the Steering** *section for information.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Turn the front wheels so that they are in the straight ahead position and tie off the steering wheel so that it cannot rotate.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in the position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

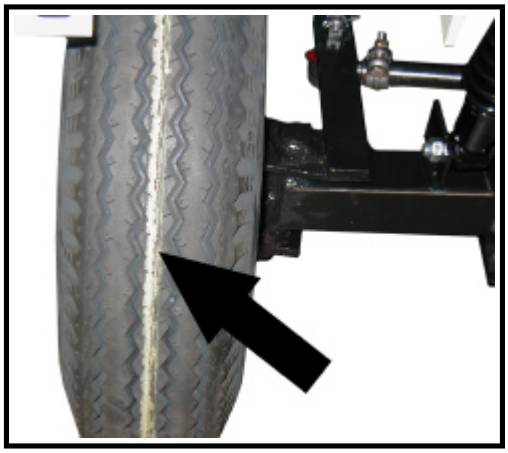
8. Using a piece of chalk, mark a line around the center of both front tires.

   HINT: Hold the chalk on the center of the tire and rotate the tire to mark the line.

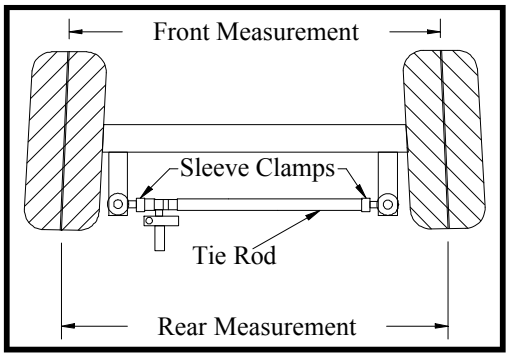
9. Loosen the ball joint clamps or the rod end jam nuts on the tie rod.

   NOTE: Remember the position and orientation of the ball joint clamps.

10. Lower the front wheels to the ground and push the vehicle back and forth a few feet to settle the suspension.



11. Measure the distance between the lines at the front of the tires.
12. Measure the distance between the lines at the rear of the tires.
13. Adjust the tie rod so that the distance at the front and rear of the tires is the same.
14. If equipped with ball joints, position the ball joint clamps in their original location and orientation.
15. Tighten the ball joint clamps (28-32 ft. lbs.) or the rod end jam nuts.
16. Untie the steering wheel.



⚠WARNING

Rotate the steering wheel from a full left turn to a full right turn and make sure that the ball joint clamps do not contact any other component. Clamps positioned so that they contact other components may result in steering failure and loss of control of the vehicle causing severe bodily injury and/or property damage.

17. Reconnect the main positive and negative cables at the batteries.
18. Remove the blocks from behind the wheels.
19. Release the parking brake and test drive the vehicle.

INSPECT BALL JOINTS

NOTE: A set of ball joints and/or rod ends will wear at the same rate. If a ball joint and or rod end is worn out, then all should be replaced as a set.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

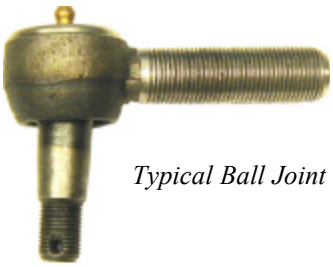
5. Disconnect the main positive and negative cables at the batteries.

6. Tie off the front wheels so that they cannot turn.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

7. While watching the ball joints, rapidly rotate the steering wheel to the left and right.
8. If the ball joint housing moves up or down then the ball joint is worn out and should be replaced. Refer to section ***Replacing a Ball Joint*** for information regarding replacing ball joints.
9. Untie the front wheels.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels.
12. Release the parking brake and test drive the vehicle.



Typical Ball Joint

INSPECT ROD ENDS

NOTE: A set of ball joints and/or rod ends will wear at the same rate. If a ball joint and or rod end is worn out, then all should be replaced as a set.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

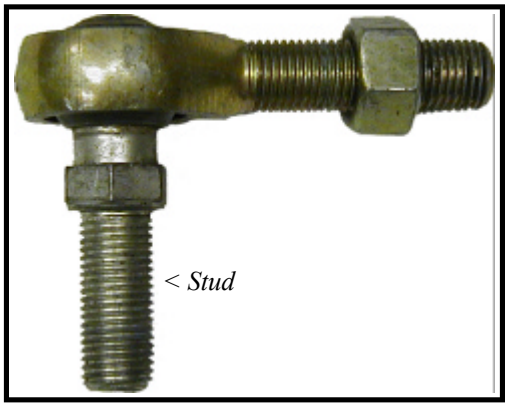
5. Disconnect the main positive and negative cables at the batteries.

6. Visually inspect each rod end for any signs of play between the ball and the nylon or brass bushing in the housing.

⚠WARNING

Do not drive the vehicle while the steering wheel or front wheels are tied in position. Driving the vehicle while the steering wheel or front wheels tied in position may cause loss of control of the vehicle resulting in severe bodily injury and/or property damage.

7. If any play is evident, then the rod end is worn out and should be replaced. Refer to section ***Replace the Ball Joints, Tie Rods, and Drag Link*** for information regarding replacing ball joints.
8. Reconnect the main positive and negative cables at the batteries.
9. Remove the blocks from behind the wheels.
10. Release the parking brake and test drive the vehicle.



Typical rod end. Studded rod end shown, your vehicle may be equipped with spherical rod ends that do not have a stud.

ADJUST THE STEERING GEAR

NOTE: In some vehicle configurations it may be necessary to remove the steering gear to perform this procedure. Refer to **Replace the Steering Gear** *for information regarding removing the steering gear.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

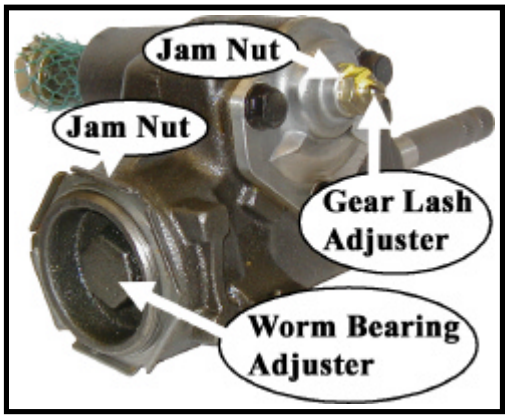
6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in serious bodily injury.

7. Disconnect the drag link from the pitman arm.

   NOTE: Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint from the drag link.*



8. Loosen the gear lash jam nut and the worm bearing adjuster jam nut.
9. Unscrew the gear lash adjuster all of the way to the stop.
10. Loosen the worm bearing adjuster and then tighten just enough to remove all end play from the input shaft and then an additional 1/8 turn more.
11. While holding the worm bearing adjuster so that it cannot turn, tighten the worm bearing adjuster jam nut.
12. Find the center position of the steering shaft:

    A. Turn the steering shaft all of the way in one direction.

    B. While counting the rotations, turn the steering shaft all of the way in the opposite direction.

    C. Turn the steering shaft 1/2 the number of turns in the original direction.

13. While rotating the input shaft back and forth through its centered position, adjust the gear lash adjusting screw so that there is a slight drag as the steering gear is rotated through its centered position.
14. While holding the gear lash adjusting screw so that it cannot turn, tighten the gear lash adjusting screw jam nut.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the parking brake and test drive the vehicle.

REPLACE THE STEERING SHAFT

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

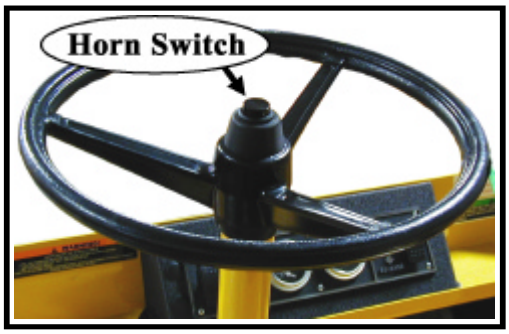
3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

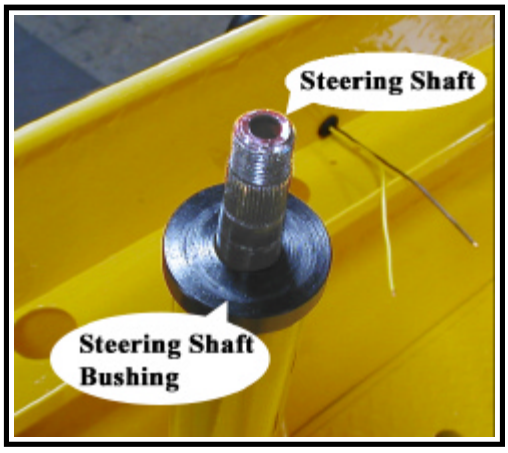
5. Disconnect the main positive and negative cables at the batteries.

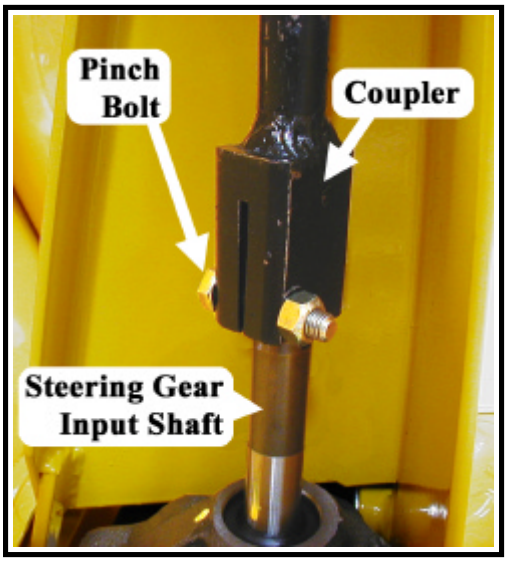
6. If equipped with a horn switch in the steering wheel, remove the switch, disconnect the wires from the switch and cut the terminals off of the wires.
7. Remove the steering wheel.

   NOTE: Refer to **Replace the Steering Wheel** *section for information regarding removing the steering wheel.*
8. Remove the upper steering shaft bushing or bearing from the steering column.



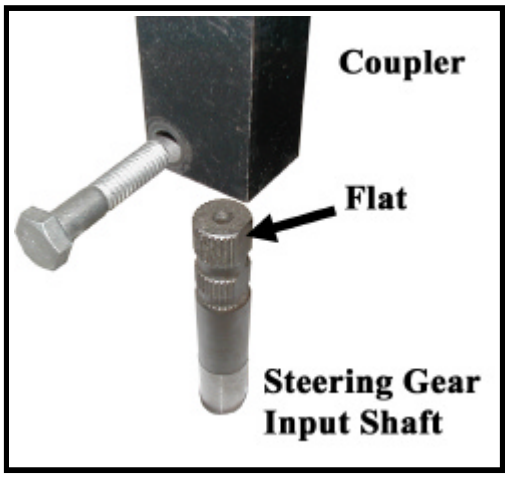
9. Remove the steering gear access cover from the steering column (if equipped).
10. Remove and discard the pinch bolt and nut from the steering shaft coupler.





NOTE Most vehicle configurations will now allow the steering shaft to slide off of the steering gear input shaft and then back down out of the steering column. If there is not enough clearance for this procedure then the steering gear must be removed. Refer to **Replace the Steering Gear** *for information regarding removing the steering gear.*

11. Remove the steering shaft from the vehicle.
12. Lightly grease the input shaft splines, steering wheel splines and the upper steering shaft bushing.
13. Install the steering shaft in reverse order using a new pinch bolt. Orientate the shaft so that the pinch bolt is opposite the flat in the steering gear shaft. See the illustration to the right.



⚠WARNING

Make sure that the pinch bolt is not aligned with the flat on the steering shaft. Aligning the bolt with the flat could result in failure of the steering and loss of control of the vehicle. This could lead to property damage and/or severe bodily injury.

⚠WARNING

Do not use the original pinch bolt and nut. Failure to replace the pinch bolt and nut may result in failure of the steering causing loss of control of the vehicle. This could lead to property damage and/or severe bodily injury.

14. Tighten the pinch bolt to 24-26 ft-lbs.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the parking brake and test drive the vehicle.

REPLACE THE STEERING WHEEL

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

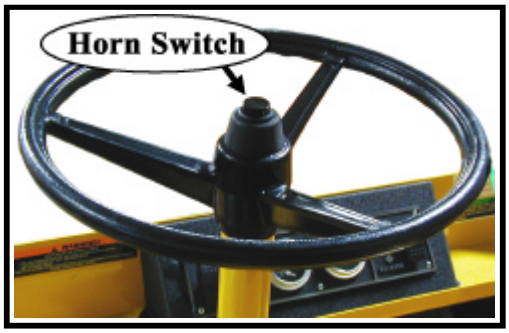
2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. If equipped with a horn switch in the steering wheel, remove the switch and disconnect the wires from the switch.
7. Remove the steering wheel nut.
8. Using a steering wheel puller, remove the steering wheel.
9. Position the front wheels in the straight ahead position.



10. Lightly grease the steering wheel splines and install the replacement steering wheel orientated as shown in the illustration to the right.
11. Tighten the steering wheel nut to 28-32 ft lbs.
12. Reinstall the horn switch (if equipped).
13. Reconnect the main positive and negative cables at the batteries.
14. Remove the blocks from behind the wheels.
15. Release the parking brake and test drive the vehicle.

REPLACE THE STEERING GEAR

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

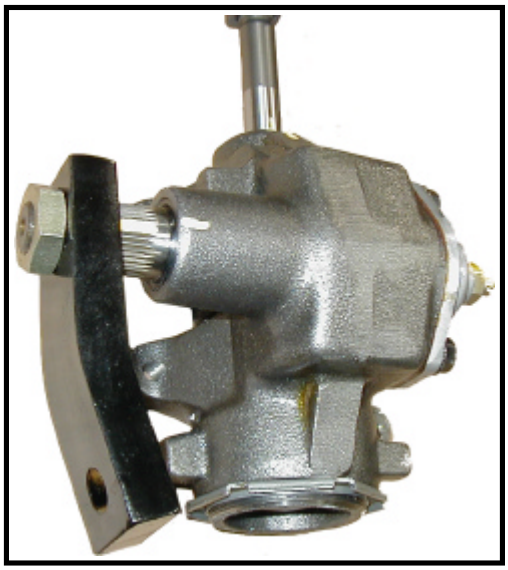
4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Remove the steering wheel. Refer to ***Replace the Steering Wheel*** section for information regarding removing the steering wheel.
7. Remove the steering shaft. Refer to ***Replace the Steering Shaft*** section for information regarding removing the steering shaft.
8. Remove the pitman arm using a pickle fork.

   NOTE: On some vehicle configurations it may be required to remove the drag link from the pitman arm. Refer to **Replace the Ball Joints** *section for information regarding removing the ball joint from the pitman arm.*

9. Support the steering gear so that it cannot fall out of the vehicle.
10. Remove the bolts holding the steering gear to the vehicle frame and remove the steering gear from the vehicle.



Steering Gear with Pitman Arm

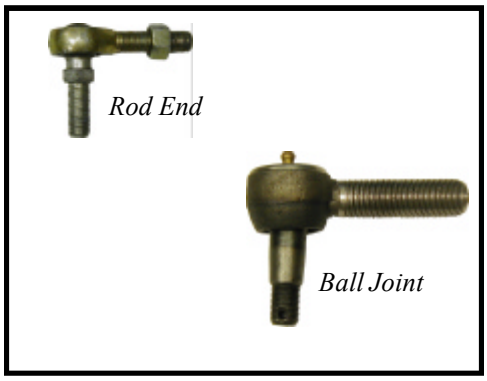
⚠WARNING

Failure to support the steering gear will result in the steering gear falling out of the vehicle and could cause property damage and/ or severe bodily injury.

11. Center the steering gear. Refer to ***Center the Steering Gear*** section for information regarding centering the steering gear.
12. Install in reverse order. Torque the pitman arm nut to 75-100 ft-lbs.
13. Reconnect the main positive and negative cables at the batteries.
14. Remove the blocks from behind the wheels.
15. Release the parking brake and test drive the vehicle.

REPLACE THE BALL JOINTS, TIE RODS, AND DRAG LINK

This section will refer to two different types of ball joints. One type is has a grease fitting and a tapered shaft where it is installed on the steering arm or pitman arm. The second cannot be greased and has a straight shaft. See the illustrations to the right. Depending on the configuration of your vehicle, it may be equipped one or both types of ball joints.



In this text:
The first type will be referred to as a "Ball Joint."
The second type will be referred to as a "Rod End."

NOTE: If a rod end or ball joint is worn out, we recommend replacing all of the ball joints and/or rod ends as a set.

Replacing a Rod End

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. If equipped with a hand operated park brake, set the brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

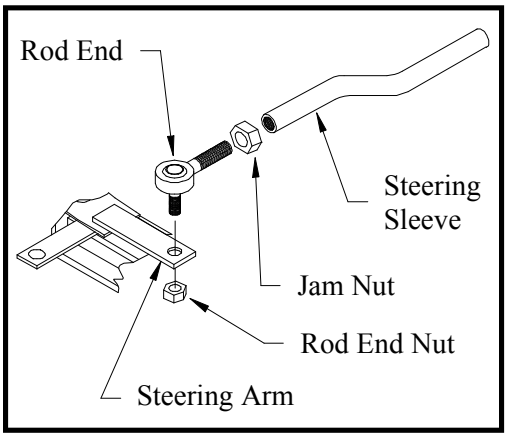
6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Loosen the rod end jam nut or clamp on the steering sleeve.
8. Remove the rod end nut.
9. Remove the rod end from the steering arm.

HINT: Count the number of turns required to remove the rod end from the steering sleeve. This will make it easier to realign the wheels.



10. Install the new rod end into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the rod end clamp or jam nut at this time.
11. Install the rod end into the steering arm. Tighten the rod end nut to 20-25 ft-lbs.
12. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

Replacing a Ball Joint

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

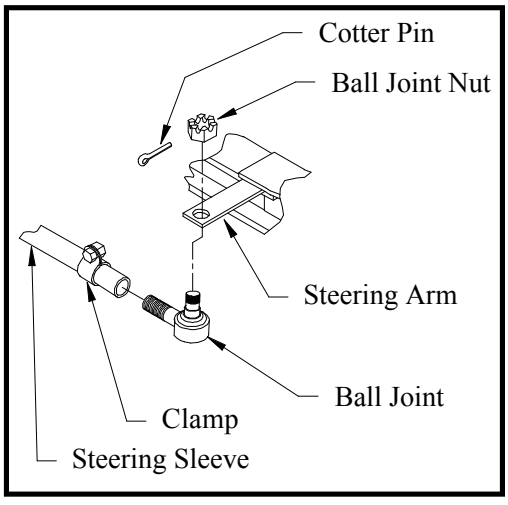
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Loosen the ball joint clamp on the steering sleeve.
8. Remove the cotter pin and ball joint nut.
9. Using a pickle fork, remove the ball joint from the steering arm.
10. Remove the ball joint from the steering sleeve.

    HINT: Count the number of turns required to remove the ball joint from the sleeve. This will make it easier to realign the wheels.

11. Install the new ball joint into the steering sleeve. Screw it into the sleeve the same number of turns counted in the previous step. Do not tighten the ball joint clamp at this time.



12. Install the ball joint into the steering arm. Tighten the ball joint nut to 40-45 ft-lbs. and install a new cotter pin.
13. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*

14. Lower the vehicle.
15. Reconnect the main positive and negative cables at the batteries.
16. Remove the blocks from behind the wheels.
17. Release the park brake and test drive the vehicle.

Replacing the Drag Link

The Drag Link is the linkage that connects the steering gear pitman arm to the steering knuckle. Refer to the illustration on the following page.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. If equipped with a hand operated park brake, set the brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

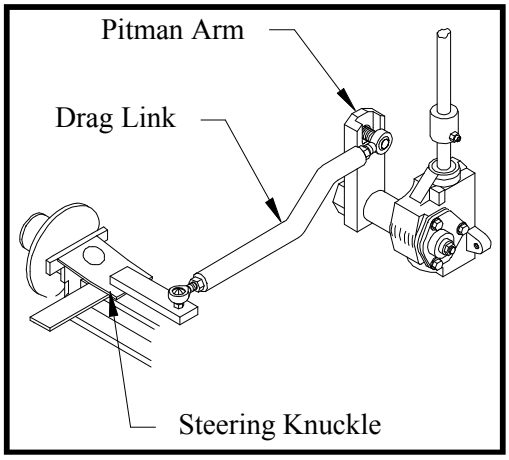
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the ball joints or rod ends from the steering knuckle and pitman arm.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

8. Remove the drag link as an assembly.
9. Install in reverse order.
10. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*



Typical Drag Link

11. Lower the vehicle.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.

Replacing the Tie Rod

The Tie Rod is the linkage that connects the two steering knuckles together. Refer to the illustration below..

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

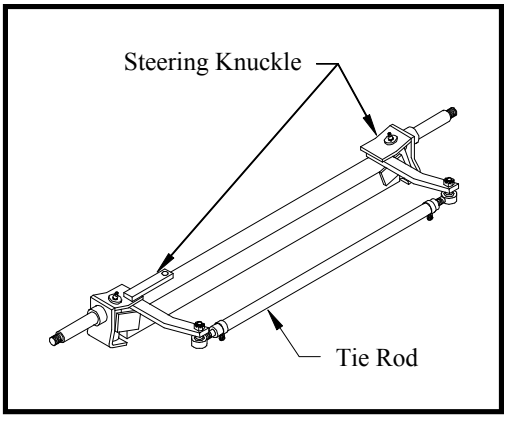
Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the ball joints or rod ends from the steering knuckles.

   NOTE: Refer to the **Replacing the Ball Joints** *section for information regarding the removal of the ball joints or rod ends.*

8. Remove the tie rod as an assembly.
9. Install in reverse order.
10. Realign the front wheels.

    NOTE: Refer to the **Steering** *section for information regarding realignment of the front wheels.*



Typical Front Axle Assembly

11. Lower the vehicle.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from behind the wheels.
14. Release the park brake and test drive the vehicle.

CENTER THE STEERING GEAR

1. Remove the pitman arm.
2. Rotate the input shaft clockwise until it stops.
3. While counting the rotations, rotate the input shaft counter clockwise until it stops.
4. Rotate the input shaft clockwise 1/2 the rotations counted in the previous step.
5. Mark the steering gear input shaft and pitman shaft in relation to the housing for reference.

PITMAN SHAFT ALIGNMENT

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. If equipped with a hand operated park brake, set the brake.
4. Place blocks under the rear wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Center the steering gear. Refer to ***Center the Steering Gear*** section for information regarding centering the steering gear.
8. Screw both steering stops all of the way in.
9. Install the pitman arm so that it is centered between the steering stops.
10. Realign the front wheels. Refer to ***Front End Alignment*** section for information regarding aligning the front wheels.
11. Adjust the steering stops so that the front wheels do not contact any part of the frame, suspension or steering linkages and the left and right turning radiuses are equal.
12. Tighten the steering stop jam nuts.
13. Lower the vehicle.
14. Reconnect the main positive and negative cables at the batteries.
15. Remove the blocks from behind the wheels.
16. Release the park brake and test drive the vehicle.

REPAIR THE STEERING GEAR

Disassembly

NOTE: The steering gear must be removed from the vehicle for this procedure. Refer to **Replace the Steering Gear** *section for information regarding removing the steering gear.*

NOTE: The steering gear is packed with grease. Only perform maintenance on the steering gear in an area that will contain any grease that may spill out of the steering gear when it is disassembled.

Refer to the illustration at the end of this section for a blown up view of the steering gear assembly.

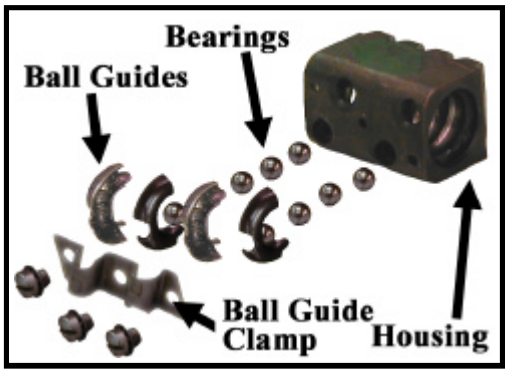
1. Center the steering gear.
   A. Turn the steering shaft all of the way in one direction.
   B. While counting the rotation, turn the steering shaft all of the way in the opposite direction.
   C. Turn the steering shaft 1/2 the number of turns in the original direction.
2. Remove the worm bearing adjuster locking ring and the worm bearing adjuster.

3. Remove the side cover/pitman shaft assembly by removing the three side cover bolts and then pulling the assembly out of the housing.

   NOTE: The side cover/pitman shaft assembly normally does not have to be disassembled.

4. Remove the worm shaft and ball nut assembly from the bottom of the housing.
5. Remove the worm shaft seal.
6. Remove the pitman shaft seal.
7. Remove the upper worm bearing and bearing cup from the housing.

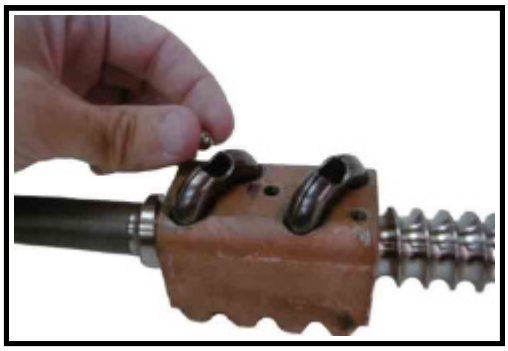
8. The ball nut assembly consists of two sets of ball bearings that recirculate in two channels in the ball nut housing. The bearings may fall out once the bearing guides are removed. Be careful not to lose any of the bearings.
9. Remove the ball guide clamps, ball guides and all of the ball bearings.
10. Remove the ball nut from the worm shaft.
11. Thoroughly clean and inspect all parts for signs of corrosion, damage or wear and replace as required.



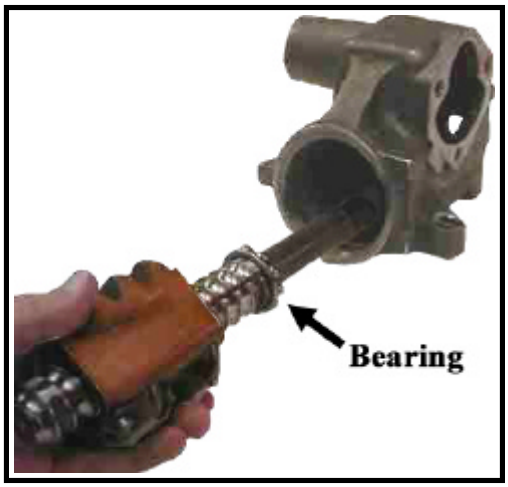
Reassembly

1. Lightly lubricate all parts before reassembly.
2. Install a new worm shaft seal and pitman shaft seal into the housing.
3. Install the upper worm bearing cup.
4. Divide the ball bearing into two equal groups.
5. Position the ball nut onto the worm as shaft as shown in the illustration.
6. Insert the ball guides into the ball nut.
7. Insert each group of bearings into the ball guides.

   NOTE: Do not rotate the worm shaft while installing the bearings. This may cause one or more of the bearings to enter the crossover passage in the ball nut, causing improper operation.
8. Install the ball guide clamp.

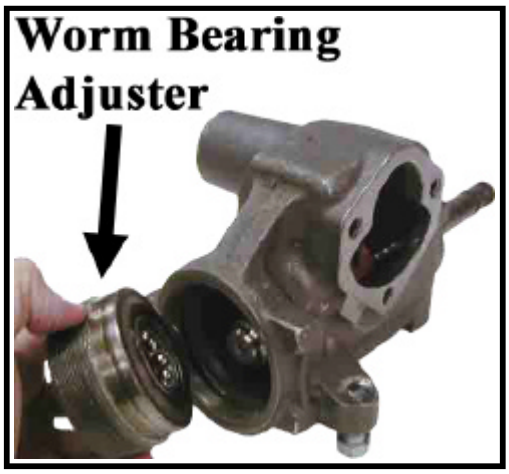


9. Place the upper worm bearing on the worm shaft and install the worm shaft/ball nut assembly into the housing being careful not to damage the worm shaft seal.



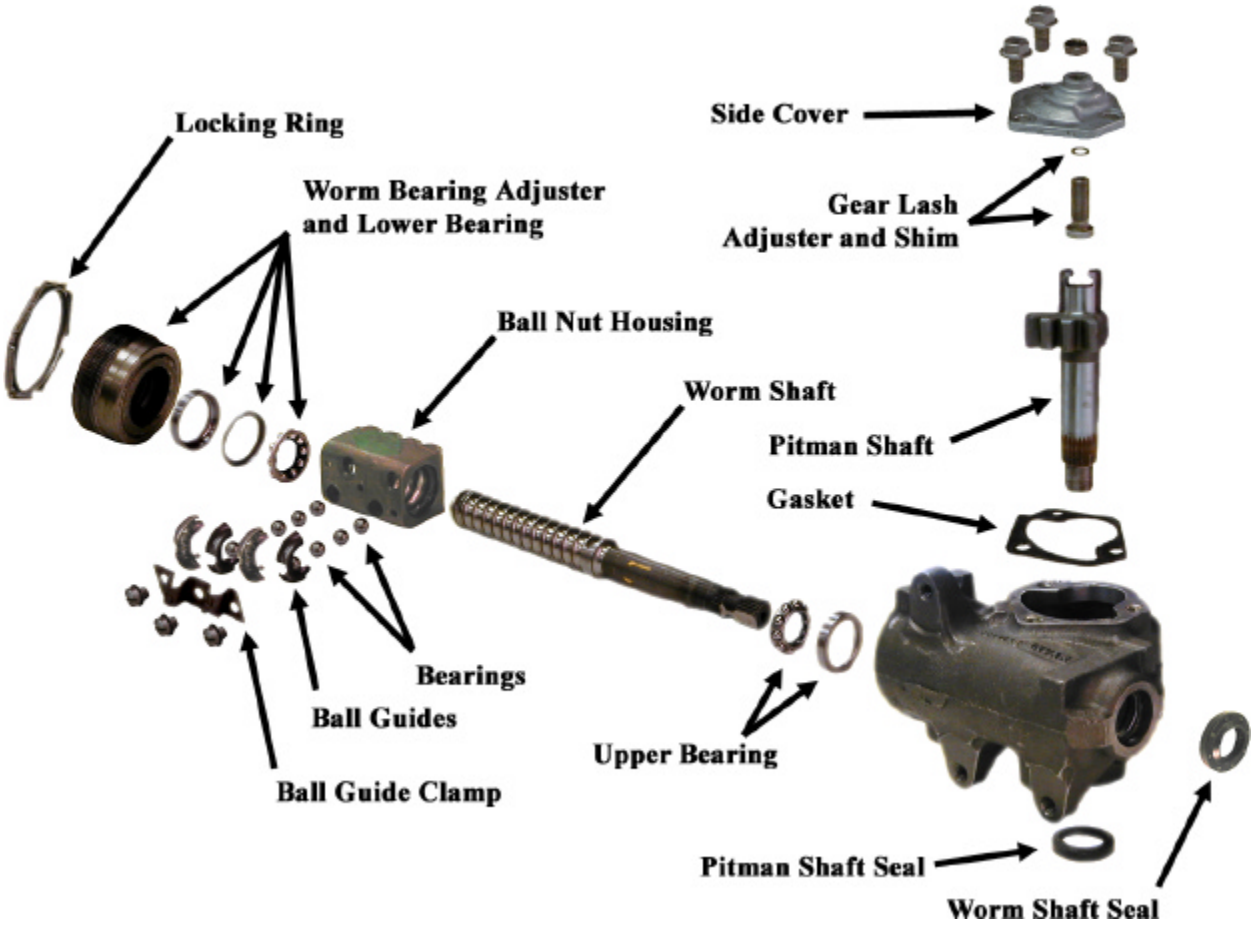
10. Install the assembled worm bearing adjuster into the housing and tighten just enough to remove all play in the worm shaft.
11. Install, but do not tighten the worm bearing adjuster lock nut.
12. Rotate the worm shaft to center the ball nut in the housing.
13. Place a new gasket onto the housing and install the assembled pitman shaft/side cover onto the housing using two of the three mounting bolts.
14. Pack the steering gear with grease through the open side cover bolt hole and then install the bolt.
15. Adjust the steering gear.

    NOTE: Refer to **Adjust the Steering** *gear section for information regarding adjusting the steering gear.*



16. Once the adjustments are completed, make sure that the locking ring and jam nut are tight.

Exploded View of Steering Gear



Brake Service

TABLE OF CONTENTS

Inspect the Service Brake 2
- Disc Brake Pads 2
- Disc Brake Rotor 3

Inspect the Automatic Parking Brake 4
Adjust the Automatic Parking brake 4
Adjust the Service Brakes 4
- Two or Four Wheel Hydraulic Disc Brakes 4

Check Master Cylinder Fluid 5
Bleed the Brake System 6
Flush the Brake System 8
Replace Front Disc Brake Pads 9
Replace Rear Brake Pads 11
- Hydraulic Disc 11

Replace the Wheel Cylinder 13
- Disc Brake Body Assembly (front or rear) 13

Replace the Master Cylinder 15
Repair the Master Cylinder 17

INSPECT THE SERVICE BRAKE

Disc Brake Pads

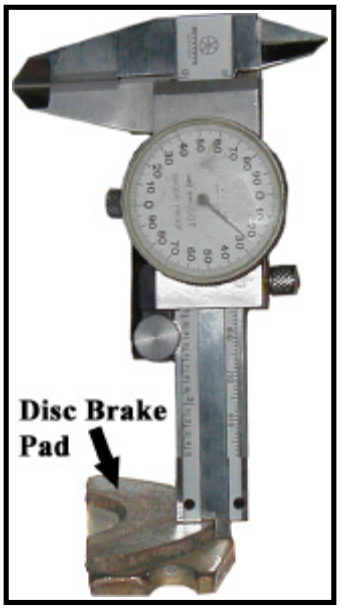
⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

NOTE: The brake pad must be removed to accurately measure the lining thickness. Refer to **Replace the Front or Rear Brake Pads** *section for information on removing the brake pads.*

Measure the brake pad lining at the thinnest point on the pad. If the brake pad lining is 1/16-inch or less then the brake pad must be replaced.

It is recommended to replace the left and right side brake pads as a set.



Disc Brake Rotor

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to Appendix C for recommended handling precautions.

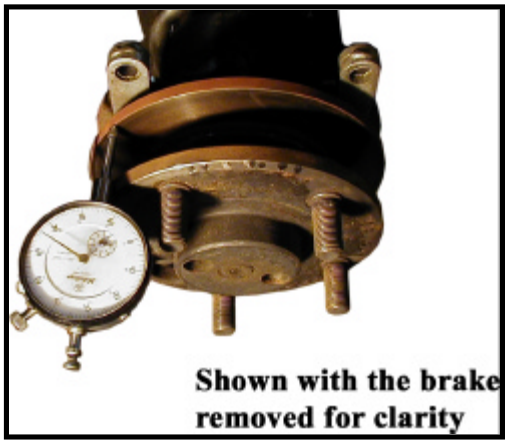
NOTE: The front brake rotor is an integral part of the front hub. If the brake rotor is worn beyond its service limits, then the front hub must be replaced. Refer to **Front Axle Service** *for information on replacing the front hub.*

NOTE: Depending on the rear axle configuration, the rear brake rotor may be an integral part of the rear axle. If the brake rotor is worn beyond its service limits, then the rear axle must be replaced. Refer to **Transmission** *section for information regarding replacing the rear axle*

NOTE: The wheel must be removed to accurately measure the rotor thickness. Refer to **Tires and Wheels** *section for information on removing the wheel.*

1. Measure the run out of the rotor at its maximum diameter. If the run out exceeds 0.005, then the rotor must be machined. Do not machine the rotor beyond its service limits.

   NOTE: A bent axle or damaged rear axle could cause excessive brake rotor run out.

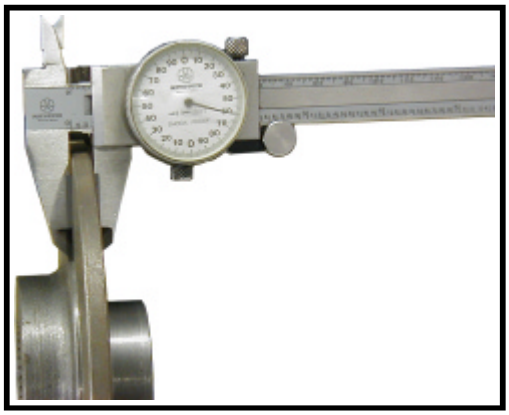


Shown with the brake removed for clarity

2. Measure the thickness of the brake rotor in 3 places. If the brake rotor thickness is less than 0.20-inches, then the rotor must be replaced.

⚠WARNING

Do not use a rotor that is worn beyond its service limits. A rotor worn beyond its service limits could fail and cause loss of brakes resulting in severe bodily injury and/or property damage.



Rotor removed for clarity. The rotor does not have to be removed for this procedure.

INSPECT THE AUTOMATIC PARKING BRAKE

The parking brake is located inside of the motor and is electromagnetically operated. To inspect operation of the parking brake, disconnect the harness to the parking brake and push the vehicle to confirm that the brake is applied.

The rubber band dust seal should fit snug around the brake. Inspect the seal for any indications of cracking or fatigue.

ADJUST THE AUTOMATIC PARKING BRAKE

The parking brake is electromagnetically operated and is either fully applied or off, there are no adjustments. The brake is OFF when power is applied to the brake.

ADJUST THE SERVICE BRAKES

The hydraulic disc brake system is automatically adjusted. A low brake pedal or lack of braking power could be caused by:

- Brake fluid level low in the master cylinder. See ***Check the Master Cylinder Fluid*** section.
- Air in the brake lines. See ***Bleed the Brakes*** section.
- Worn brake pads. See ***Inspect the Service Brake*** section.
- Worn brake rotor. See ***Inspect the Service Brake*** section.
- Binding brake pedal linkage.

If you are experiencing a low brake pedal or lack of braking power, the entire brake system should be inspected.

CHECK MASTER CYLINDER FLUID

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Thoroughly clean the area around the master cylinder cap.
7. Remove the master cylinder cap.
8. If the fluid in the master cylinder is contaminated then the entire brake system must be flushed. Refer to ***Bleed the Brakes*** for information regarding flushing the brake system.
9. Fill with brake fluid from a new sealed container to within 1/4-inch of the top of the master cylinder chamber and reinstall the cap.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove blocks from behind the wheels.
12. Release the parking brake and test drive the vehicle.

Master cylinder is located between the front seats.

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

BLEED THE BRAKE SYSTEM

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

NOTE: Start this procedure at the wheel furthest from the master cylinder, then work toward the wheel closest to the master cylinder.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Thoroughly clean the area around the master cylinder cap and remove the cap.

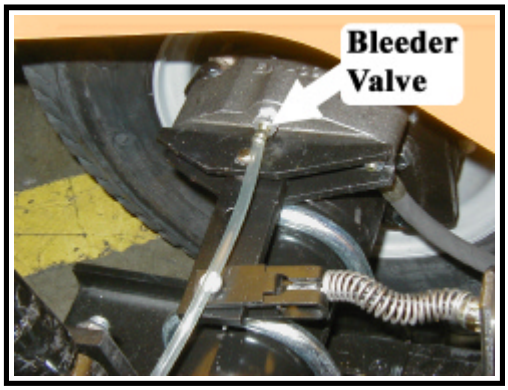
Master cylinder is located between the front seats. Dual reservoir shown.

7. Add brake fluid from a new sealed container to the master cylinder. Fill to 1/4" from the top of the master cylinder chamber.

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

8. The master cylinder fluid level will drop as the brakes are bled. Periodically check and fill the master cylinder during this procedure. Do not allow the fluid level in the master cylinder to drop too low as this will allow air into the brake lines.
9. Attach a clear hose to the bleeder valve on the brake cylinder that is to be bled. Route the hose into a clear container for waste brake fluid.
10. Pump the brake pedal a few times and then press and hold light pressure to the brake pedal.
11. Open the bleeder valve on the hydraulic brake body.
12. Depress the foot pedal to the floor and then close the bleeder valve. Do not release pressure on the brake pedal until the bleeder valve is closed.
13. Slowly release the foot pedal, allowing it to return to its released position.



Bleeder valve with hose attached

NOTE: Check and fill the master cylinder frequently during the bleeding process. Do not allow the fluid level in the master cylinder to drop low enough to allow air to enter the brake lines. If air enters the brake lines during the bleeding process, then you will have to start again from the beginning.

⚠WARNING

Always use brake fluid from a new sealed container. Never reuse any brake fluid that has been removed from the brake system. Use of contaminated brake fluid will degrade the braking performance and may cause property damage or severe bodily injury.

14. Repeat the above steps until you are sure that all of the air is expelled from the brake line. Any air bubbles that can be seen in the clear hose attached to the bleeder is an indication that there is still air in the brake lines.
15. Repeat this process with each of the other wheels.

    NOTE: When finished, top off the master cylinder with fluid. See **Check Master Cylinder Fluid** *for information on filling the master cylinder.*

16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.

FLUSH THE BRAKE SYSTEM

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear wheels off of the ground and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. If equipped with front brakes, raise the front wheels off of the ground and support with jack stands.
8. Release the park brake.
9. Remove both rear wheels and, if equipped with front brakes, the front wheels. Refer to ***Tires and Wheels*** section for information regarding removing the wheels.
10. Remove the wheel cylinders from each axle. Refer to ***Replace the Wheel Cylinder*** section for information regarding removing the wheel cylinder.
11. Attach a clear hose to the bleeder valve on each of the wheel cylinders and route the hoses into a container for waste brake fluid.
12. Position the wheel cylinders so that the bleeder screw is pointing to the ground and open all bleeder screws.
13. Pump the master cylinder until all fluid has been pumped from the brake lines and all wheel cylinders.
14. Close all bleeder screws.
15. Fill the master cylinder with fluid.
16. Open one of the bleeder screws and pump the master cylinder until all fluid has been pumped from the master cylinder and close the bleeder screw.
17. Repeat the above two steps for each wheel cylinder.
18. Reinstall the wheel cylinders and bleed the brakes. Refer to ***Bleed the Brakes*** for information regarding bleeding the brakes.
19. Set the park brake.
20. Install the wheels and lower the vehicle to the ground.
21. Reconnect the main positive and negative cables at the batteries.
22. Release the park brake and test drive the vehicle.

REPLACE FRONT DISC BRAKE PADS

NOTE: It is recommended that both the left and right brake pads be replaced as a set.

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to appendix C for recommended handling precautions.

NOTE: Installing new brake pads will raise the brake fluid level in the master cylinder.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Thoroughly clean the area around the master cylinder cap.
7. Remove fluid from the master cylinder until it is 1/2 full.

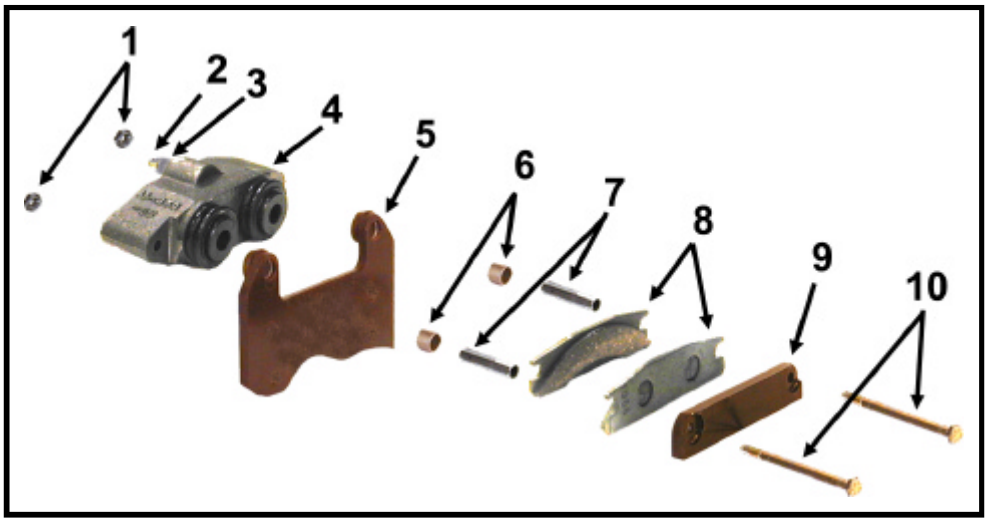
Master cylinder is located between the front seats. Dual reservoir shown.

8. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

9. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information on removing the tire and wheel assembly.



NOTE: Refer to the illustration above for the following steps.

10. Remove the brake body bolts (10) and discard the lock nuts (1) and brake pads (8).
11. Remove the spacer bushings (6) from the mounting bracket (5) and discard the bushings.
12. Inspect the brake rotor. See ***Inspect the Service Brakes*** section for information regarding inspecting the brake rotor.
13. Inspect the spacers (7) and replace if any wear or damage is found.
14. Install new spacer bushings in the mounting bracket.
15. Install new brake pads in reverse order. Torque the mounting bolts to 11 ft-lbs.
16. Repeat this procedure for the other wheel.
17. Install the tire/wheel assembly and lower the vehicle to the ground.
18. Fill the master cylinder to the proper level. Refer to ***Check Master Cylinder Fluid*** section for information on the proper master cylinder fluid level.
19. Reconnect the main positive and negative cables at the batteries.
20. Remove the blocks from behind the wheels.
21. Release the park brake and test drive the vehicle.

REPLACE REAR BRAKE PADS

Hydraulic Disc

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to appendix C for recommended handling precautions.

NOTE: It is recommended that both the left and right brake pads be replaced as a set.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

NOTE: Installing new brake pads will raise the brake fluid level in the master cylinder.

6. Thoroughly clean the area around the master cylinder cap.
7. Remove fluid from the master cylinder until it is 1/2 full.

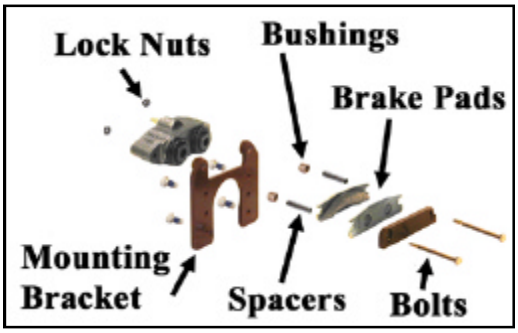
Master cylinder is located between the front seats. Dual reservoir shown.

8. Raise the rear of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

9. Remove the tire/wheel assembly.
   NOTE: Refer to **Tires and Wheels** *section for information on removing the tire and wheel assembly.*
10. Release the park brake (wheel brake only).
11. Remove the brake body bolts and discard the lock nuts and brake pads.
12. Remove the spacer bushings from the mounting bracket and discard.
13. Inspect the brake rotor. Refer to ***Inspect the Service Brake*** section for information regarding inspecting the brake rotor.
14. Inspect the spacers and replace if any wear or damage is found.
15. Install new spacer bushings in the mounting bracket.
16. Back off the parking brake adjustment (wheel park brake only).



17. Install new brake pads in reverse order. Torque the mounting bolts to 11 ft-lbs.
18. Repeat this procedure for the other wheel.
19. Install the tire/wheel assembly and lower the vehicle to the ground.
20. Fill the master cylinder to the proper level. Refer to ***Check Master Cylinder Fluid*** section for information regarding the correct master cylinder fluid level.
21. Set the park brake.
22. Reconnect the main positive and negative cables at the batteries.
23. Remove the blocks from behind the wheels.
24. Release the park brake and test drive the vehicle.

REPLACE THE WHEEL CYLINDER

Disc Brake Body Assembly (front or rear)

⚠WARNING

Current Taylor-Dunn® brakes are asbestos free. However, there is the possibility that the original brakes were replaced with aftermarket parts containing asbestos. Since this possibility exists, all brake parts should be handled as if they contain asbestos. Refer to appendix C for recommended handling precautions.

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

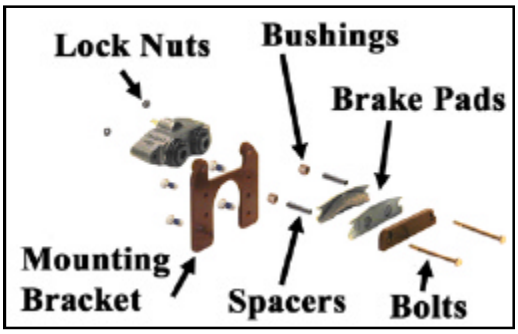
1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Release the park brake.
7. Raise the wheel off of the ground and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

8. Remove the tire/wheel assembly. Refer to ***Tires and Wheels*** section for information on removing the tire and wheel assembly.
9. Thoroughly clean the area around the brake body.
10. Remove the brake body bolts and discard the lock nuts.
11. Inspect the brake rotor. Refer to ***Inspect the Service Brake*** section for information regarding inspecting the brake rotor.
12. Disconnect the brake hose from the brake body.
13. Install the new brake body assembly in reverse order.
    - Use teflon tape thread sealant on the brake hose fitting.
    - Torque the brake body bolts to 11 ft-lbs.



14. Bleed the brakes. Refer to ***Bleed the Brakes*** section for information regarding bleeding the brakes.
15. Set the park brake.
16. Reconnect the main positive and negative cables at the batteries.
17. Lower the wheel to the ground.
18. Remove the blocks from behind the wheels.
19. Release the park brake and test drive the vehicle.

REPLACE THE MASTER CYLINDER

⚠WARNING

Do not ingest brake fluid or allow contact with skin or eyes. Always wear protective clothing and a face shield when working with or around brake fluid.

SKIN CONTACT

Flush area immediately with water for several minutes. If a rash or skin irritation develops, get medical attention immediately.

EYE CONTACT

Immediately flush the eye with water for 15 minutes and call physician.

INGESTION

Get medical attention immediately.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **If equipped with a hand operated park brake, set the brake.**
4. **Place blocks under the rear wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

NOTE: Most vehicle configurations do not require lifting the vehicle to remove the master cylinder. Lifting the vehicle may not be required.

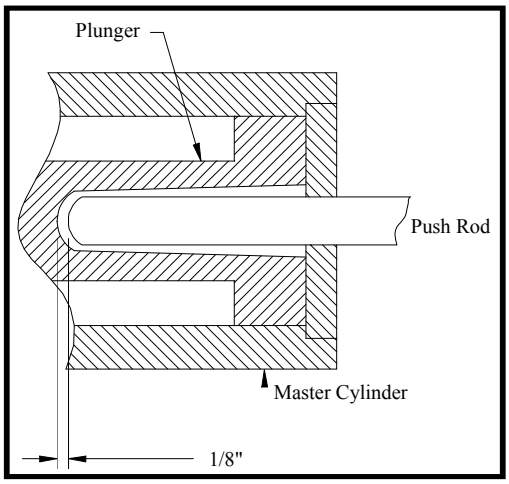
6. If required, raise the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Place a drain pan under the master cylinder.
8. Disconnect the brake line(s) to the master cylinder and pump out the fluid in the master cylinder by depressing the pedal several times.
9. Remove the master cylinder bolts and remove the master cylinder from the vehicle.

10. Install in reverse order.
11. Adjust the master cylinder push rod so that it is approximately 1/8 inch away from the master cylinder plunger when the brake pedal is up.
12. Fill the master cylinder with brake fluid from a sealed container.
13. Pump the brake pedal a short distance of one to two inches until no bubbles are seen coming from the inlet ports inside of the master cylinder chamber.
14. If the vehicle was raised, lower it to the ground.
15. Bleed the brakes. refer to ***Bleed the Brakes*** section for information regarding bleeding the brakes.
16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from behind the wheels.
18. Release the park brake and test drive the vehicle.



Cutaway of typical master cylinder showing the push rod clearance

⚠WARNING

- **Only use DOT 3 brake fluid from a new sealed container.**
- **DOT 3 brake fluid is corrosive and will damage paint finishes.**
- **Dispose of brake fluid in accordance with local state and federal regulations.**
- **Read and follow all warnings on the brake fluid container.**

REPAIR THE MASTER CYLINDER

NOTE: Hydraulic brake system components must be kept clean. Make sure your work area is free from dirt and debris and will contain any brake fluid spills.

Remove the master cylinder from the vehicle. See ***Replace the Master Cylinder*** section .

Drain all fluid from the master cylinder and discard.

Remove the rubber boot.

Depress the plunger and remove the plunger spring clip retainer.

Pull the plunger and all seals out of the master cylinder bore.

Thoroughly clean, inspect and replace parts as required.

If any damage is found in the bore of the master cylinder then it must be replaced.

Lubricate all parts with clean brake fluid from a sealed container.

Reassemble in reverse order.

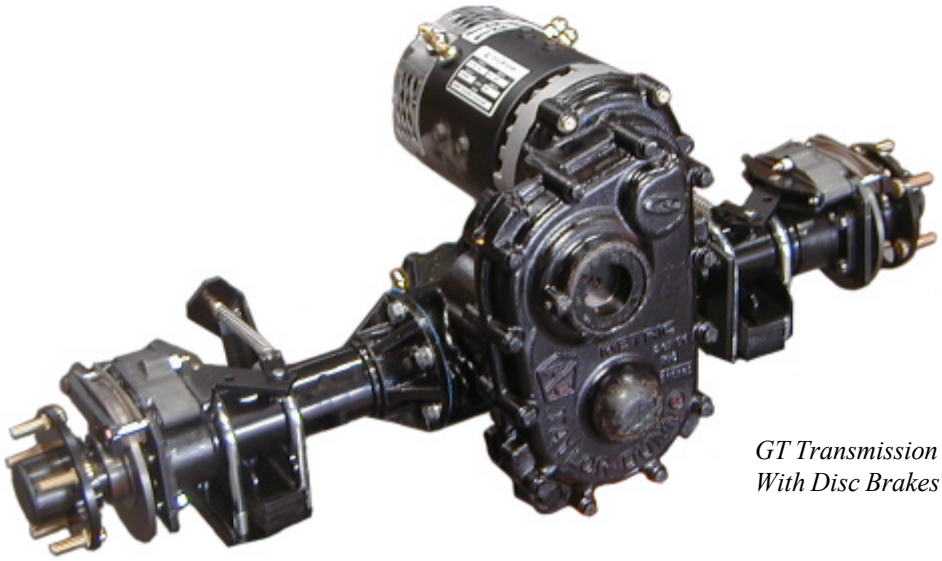
If the master cylinder is not to be immediately installed onto a vehicle, plug the brake line fitting hole to prevent any contaminates from entering the master cylinder.

TAYLOR - DUNN

Transmission

TABLE OF CONTENTS

Check Oil Level 2
Change Oil 3
Motor Removal and Installation 4
Rear Hub or Rotor 5
Removing and Installing the Rear Axles (Disc Brakes) 6
Transmission Assembly 8
Remove and Install 8
Disassembly and Reassembly of the Primary Reduction Gear Case 9
Disassembling the 3rd Member 12
Assembling the 3rd Member 15
Pinion Bearing Preload 18
Pinion Gear Shimming Instructions 19
Setting the Pinion Gear Depth 19



GT Transmission Assembly With Disc Brakes

CHECK OIL LEVEL

The oil flows freely between the main gear case (3rd member) and the primary reduction gear case. It is only necessary to check the oil level of the 3rd member.

Park the vehicle on a level surface.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

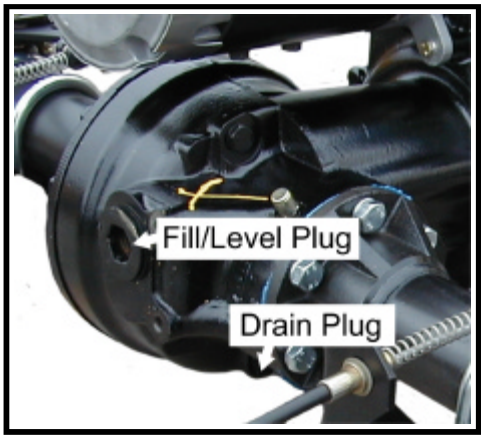
2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Place an oil drain pan underneath the 3rd member.
7. Remove the fill/level plug.
8. The oil level should be very close to the bottom of the level plug opening.
   a. If the oil level is below the bottom of the opening, add oil as required until level with the bottom of the opening. Refer to the ***Lube Chart*** section for information regarding type of oil.
   b. If oil comes out of the opening, allow to drain until level with the bottom of the opening.
9. Replace the fill/level plug.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from the wheels.
12. Release the park brake and test drive the vehicle.



CHANGE OIL

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

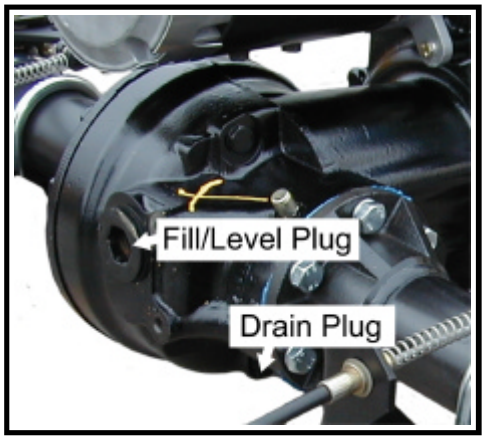
2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear of the vehicle and support with jack stands.
7. Place a four quart drain pan under the drive assembly.
8. Remove the drain plugs from the differential case and gear case.
9. Once the oil has drained, replace the drain plugs and lower the vehicle to the ground.
10. Remove the fill/level plug and fill the differential up to the bottom of the level plug opening. Refer to the ***Lube Chart*** section for information regarding type of oil.
11. Replace the fill plug.
12. Reconnect the main positive and negative cables at the batteries.
13. Remove the blocks from the wheels.
14. Release the park brake and test drive the vehicle.



MOTOR REMOVAL AND INSTALLATION

NOTE: Some applications will require removing the drive assembly from the vehicle to remove the motor. Refer to **Removing and Installing the Drive Assembly** *for information on removing the drive assembly.*

Some vehicles are equipped with an automatic electric brake. The automatic electric brake is sandwiched between the drive motor and the gear case. The electric brake is retained by the drive motor mounting screws. Once the motor is removed the electric brake will no longer be retained by any hardware.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

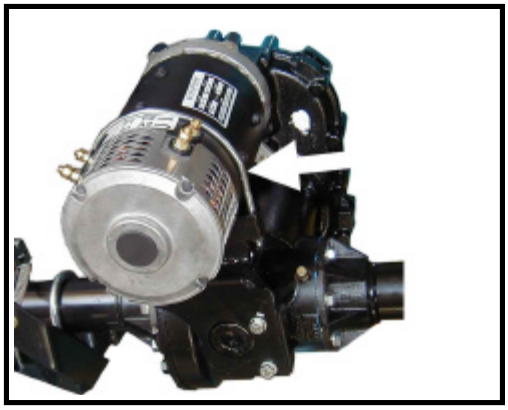
6. Remove the wires from the motor.

   NOTE: Label the motor wires with the number of the motor terminal before they are removed from the motor.

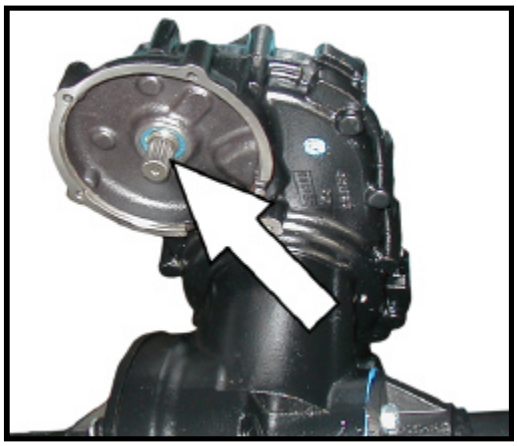
7. If equipped, remove the motor support bracket u-bolt (only used on larger motors).
8. Remove the motor mounting bolts and slide the motor off of the input shaft.
9. Install the motor in reverse order. Make sure that the motor coupler o-ring is properly installed on the transmission input shaft.

   NOTE: Apply a light coating of part number 94-421-34 moly paste grease to the splines on the transmission input shaft only.

10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels.
12. Release the park brake and test drive the vehicle.



Support bracket u-bolt



Transmission input shaft

REAR HUB OR ROTOR

NOTE: The torque specification for the axle hub bolt is 275 ft-lbs. An impact wrench will be required to remove the bolt.

NOTE: The axle hub bolt has a special thread locking compound applied to the threads. If this bolt is removed, it must be replaced.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the wheel off of the ground.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the tire/wheel assembly, Refer to ***Tires and Wheels*** section for information regarding removing the tire/wheel assembly.
8. Remove the axle hub bolt and washer and remove the hub from the axle.
9. Remove the outer brake pad. Refer to section ***Brake Service*** for information regarding removing the brake pads.
10. Remove the rotor.
11. Install in reverse order.

   a. Lightly grease the axle splines.
   b. Refer to section ***Brake Service*** for information regarding installing the brake pads.
   c. Thoroughly clean the threads in the axle shaft.
   d. Using a new bolt, torque the axle hub bolt to 275 ft-lbs.

⚠WARNING

The axle retaining plate bolts have a pre-applied thread locking compound. They are intended for one time use only. If removed they must be replaced. Reusing the original bolts could cause loss of brakes resulting in severe bodily injury and/or property damage.

Refer to section Rear Brakes in Illustrated Parts for the part number of the bolt.

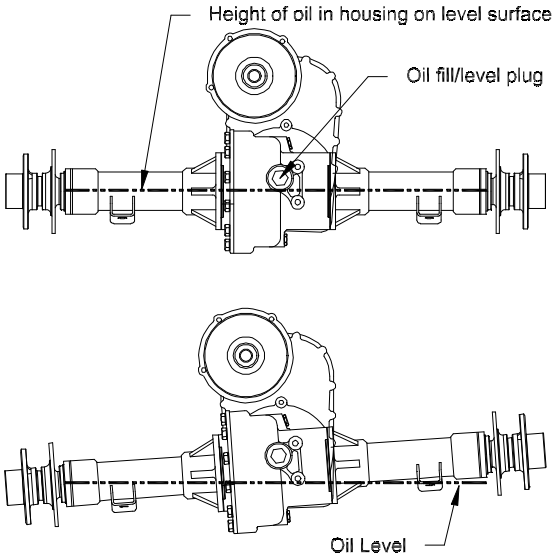
   e. Refer to ***Tires and Wheels*** section for information regarding installing the tire/wheel assembly.
12. Lower the wheel to the ground.
10. Reconnect the main positive and negative cables at the batteries.
11. Remove the blocks from behind the wheels, release the park brake and test drive the vehicle.

REMOVING AND INSTALLING THE REAR AXLES (DISC BRAKES)

The oil level in the housing is above the bottom of the axle flange. To minimize oil spills, raise the side of the vehicle high enough so that the oil level is below the bottom of the axle flange. If both axles are to be removed, you must drain all of the oil from the housing.

NOTE: This procedure does not require that the rear end or drive assembly be removed from the vehicle.

NOTE: The axle hub bolt has a special thread locking compound applied to the threads. If this bolt is removed, it must be replaced.



Raise the wheel off of the ground high enough so that the oil level is below the axle housing flange

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

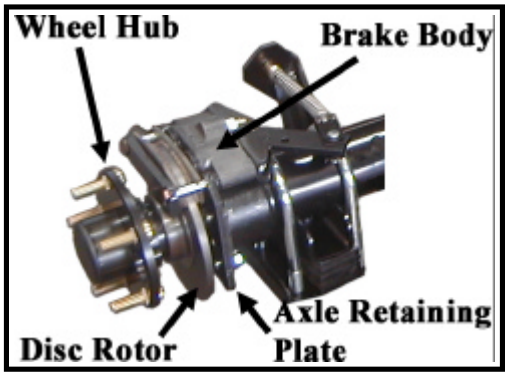
5. Disconnect the main positive and negative cables at the batteries.

6. If required, drain the oil from the 3rd member.
7. Raise the rear of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

8. Release the park brake.
9. Remove the tire and wheel assembly. Refer to section ***Tires and Wheels*** for information regarding removing the tire and wheel assembly.
   a. If the axle shaft, hub or bearing is to be replaced then remove the hub bolt, wheel hub and disc rotor at this time.
10. Remove the four bolts attached to the axle retaining plate.



11. Remove the axle retaining plate and brake body assembly as one unit.
12. Secure the brake body assembly, do not let it hang by the brake hose.
13. Pull the axle out of the housing.
14. Inspect all bearings for roughness or play, replace as needed.
15. Install in reverse order, lubricate the o-ring.

    NOTE: Be sure not to damage the o-ring.

16. Use new bolts for the axle retaining plate.

⚠WARNING

The axle retaining plate bolts have a pre-applied thread locking compound. They are intended for one time use only. If removed they must be replaced. Reusing the original bolts could cause loss of brakes resulting in severe bodily injury and/or property damage.

Refer to section Rear Brakes in Illustrated Parts for the part number of the bolt.

17. If the wheel hub was removed, install the hub and rotor. Torque the hub bolt to 275 ft-lbs.
17. Fill with oil to the level of the fill plug threads. Refer to ***Changing the Differential Oil.***
18. Lower the vehicle.
19. If equipped with a hand operated park brake, set the brake.
20. Reconnect the main positive and negative cables at the batteries.
21. Remove the blocks from behind the wheels.
22. Release the park brake and test drive the vehicle.

TRANSMISSION ASSEMBLY

Remove and Install

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

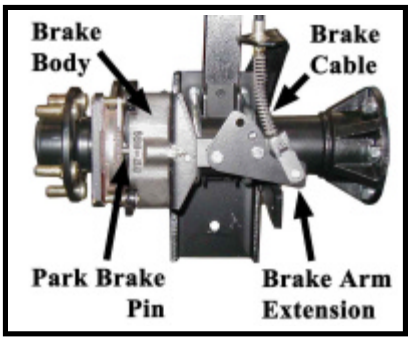
2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

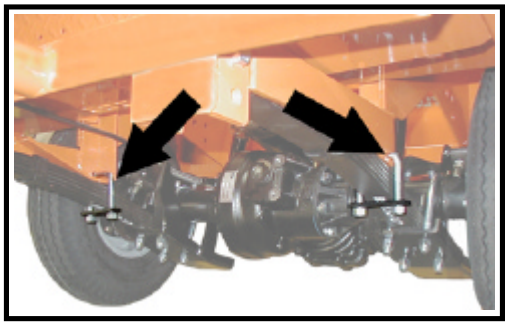
4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. If equipped with a hand operated park brake, release the brake and remove the park brake cables from the spring axle mounting brackets and brake arms.
7. Disconnect the wiring from the motor.
8. Disconnect the hydraulic brake lines from the left and right brake bodies.



9. Remove the u-bolts holding the leaf springs to the frame as shown in the illustration to the right. Do not remove the u-bolts on the axle housing.
10. Remove the lower shock mounting bolts and the front spring mounting bolts.
11. Raise the rear of the vehicle, lifting the frame up and off of the drive assembly. Support the rear of the vehicle with jack stands.



⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

12. Reinstall the drive in reverse order.
13. Bleed the brake system. Refer to ***Bleed the Brake System*** for information regarding bleeding the brakes.
14. If equipped with a hand operated park brake, set the brake.
15. Lower the vehicle.
16. Reconnect the main positive and negative cables at the batteries.
17. Remove the blocks from the wheels, release the park brake and test drive the vehicle.

DISASSEMBLY AND REASSEMBLY OF THE PRIMARY REDUCTION GEAR CASE

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear of the vehicle and support with jack stands.

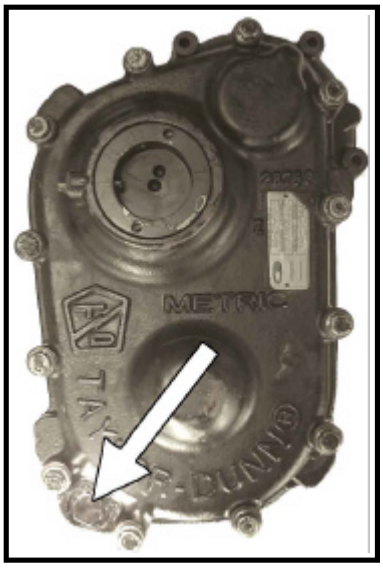
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Place a drain pan under the gear case that is capable of holding four quarts of oil and drain the oil from the front gear case.
8. If required, remove the drive assembly from the vehicle

   NOTE: Refer to **Removing and Installing the Drive Assembly** *for information on removing the drive from the vehicle.*
9. Remove the motor only if the entire drive is to be disassembled.

   NOTE: Refer to **Motor Removal and Installation** *for information on removing the motor.*

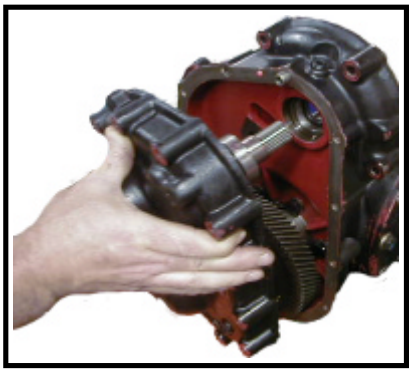


Oil Drain Plug

10. Remove the cover retaining bolts.
11. Remove the cover plate from the differential and let the remaining oil drain from the housing.

⚠CAUTION

Be careful not to damage the sealing surfaces on the housings. Damage to the sealing surface may lead to an oil leak resulting in damage to the internal parts of the drive.



12. Remove the circlip from the idler gear.

13. Remove the input shaft/bearing assembly and idler gear/ bearing assembly from the gear case cover at the same time.

14. Remove the pinion nut from the output gear and remove the output gear from the pinion shaft.

    NOTE: If necessary, remove the seal from the input shaft bore at this time.

15. Mark the gear case position in relation to the 3rd member housing so that it will be reassembled in the same position.
16. Remove the six retaining bolts holding the gear case to the 3rd member housing.

    NOTE: Make note of the angle of the gear case.

17. Remove the gear case housing from the 3rd member housing.
18. Inspect all parts for signs of wear or damage.

⚠CAUTION **Lubricate all parts with gear oil before installation. Failure to pre-lube the parts may result in premature failure.**

19. Assemble the gear case in reverse order.

    NOTE: Torque the drain plug to 21-25 foot-pounds.

    NOTE: Torque the gear case to 3rd member retaining bolts to 18-20 foot-pounds.

    NOTE: Torque the pinion nut to 154-169 foot-pounds.

    NOTE: Apply gasket sealer (#94-430-05) to the front flange on the 3rd member and gear case cover.

    NOTE: Pack the motor seal with non-acetic based grease.

20. Fill the differential with oil.

    NOTE: Refer to **Changing the Differential Oil** *for information on filling the drive with oil.*

21. Lower the vehicle.
22. Reconnect the main positive and negative cables at the batteries.
23. Remove the blocks from behind the wheels.
24. Test drive the vehicle.

DISASSEMBLING THE 3RD MEMBER

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. If equipped with a hand operated park brake, set the brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear of the vehicle and support with jack stands.

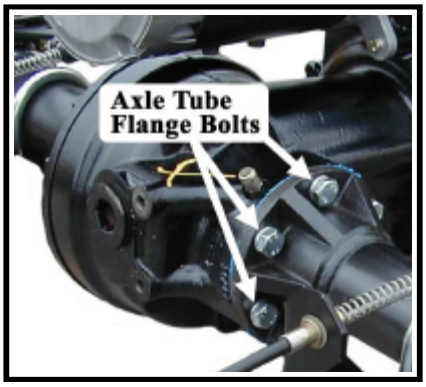
⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Remove the complete drive from the vehicle.

   NOTE: Refer to **Removing and Installing the Drive Assembly** *for information on removing the drive from the vehicle.*

8. Place a drain pan under the gear case that is capable of holding four quarts of oil and drain the oil from the front gear case and 3rd member.
9. Place the 3rd member on an appropriate stand.
10. Remove the axle shafts and tubes as an assembly from the 3rd member by removing the six axle tube flange bolts on each axle tube.
11. Remove the primary reduction gear case. Refer to ***Disassembly and reassembly of the Primary Reduction Gear Case*** for information on removing the gear case.



12. Remove the 12 side plate bolts, then remove the side plate.

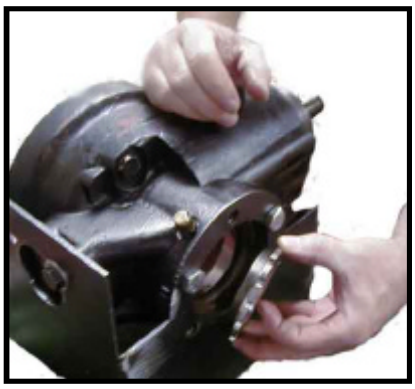
13. Remove the carrier bearing adjusting nut roll pin and adjusting nut from the side plate.

14. Turn the side plate over and remove the carrier bearing race from the side plate.

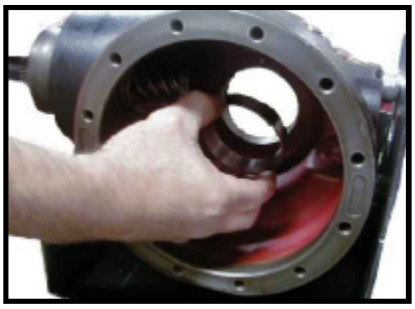
15. Remove the differential assembly from the 3rd member housing.

16. Remove the carrier bearing adjusting nut roll pin from the 3rd member housing, then remove the carrier adjusting nut.

Roll Pin



17. Remove the carrier bearing race from the 3rd member housing.



18. Remove the front bearing from the input shaft.

    NOTE: The input shaft may have to be driven out to perform this procedure.

19. Remove the input shaft's shims and spacer.

20. Remove the pinion shaft from the 3rd member.
21. Remove the front and rear pinion bearing races.
22. Inspect all parts for signs of wear or damage.
23. Thoroughly clean all parts.

ASSEMBLING THE 3RD MEMBER

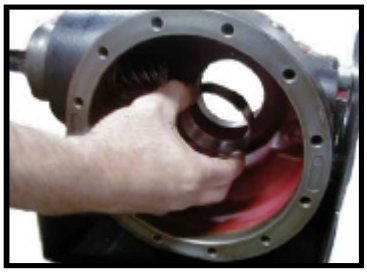
1. Temporarily install the pinion gear (hand tighten only).
2. Install the carrier bearing race ring nuts into the housing and cover.

Cover

Housing

3. Install the carrier bearing races into the housing and cover.

Cover



Housing

4. Place the differential assembly into the housing.
5. Tighten the housing carrier bearing race ring nut so that the ring gear is not in binding against the pinion gear.
6. Remove the differential assembly.

   NOTE: Do not allow the ring nut to rotate.
7. Remove the pinion gear and then reinstall the differential assembly.
8. Install the cover onto the housing using 4-bolts in a cross pattern and torque to 45-50 ft-lbs.

9. Pre set the carrier bearing preload by tightening the housing carrier bearing race ring nut until it requires 1.5 to 3.3 ft-lbs to rotate the differential assembly.

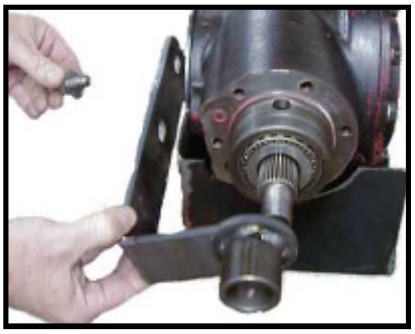
   NOTE: Rotate the carrier assembly whenever adjusting the ring nuts.

10. Mark the position of each carrier bearing ring nut in relation to the drive housing and cover and then remove the differential assembly, do not allow the ring nuts to rotate.
11. Install the pinion gear. Re-shim if required.

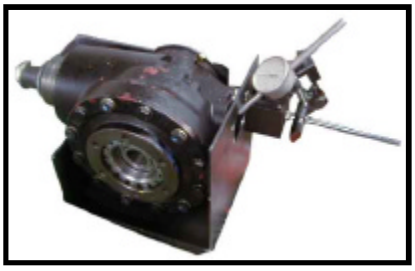
⚠CAUTION

If the ring and pinion gears or bearings are replaced then the pinion gear must be re-shimmed. Improper pinion gear shims will result in drive noise and premature failure. Refer to Pinion Gear Shimming Instructions.

12. Install the pinion gear holding tool (96-500-42) and tighten the pinion nut enough to keep the pinion gear from rotating.
13. Install the differential assembly.
14. Install the cover and all of the cover bolts. Torque to 45-50 ft-lbs.



15. Check the gear lash between the ring and pinion gears. The gear lash should be 0.005 to 0.007 inches.
16. Adjust the gear lash if needed by tightening or loosening the carrier bearing race ring nuts. The two ring nuts must be turned equally in opposite directions.



NOTE: To move the ring gear closer to the pinion: Loosen the housing carrier bearing race ring nuts and tighten the cover carrier bearing race ring nut equally.

NOTE: To move the ring gear away from the pinion: Loosen the cover carrier bearing race ring nut and tighten the housing carrier race ring nut equally.

⚠CAUTION

The two ring nuts must be turned the same amount in opposite directions. This allows the carrier assembly to be positioned with the proper gear lash without upsetting the bearing preload. If the ring nuts are not turned the same amount, then the bearing preload will no longer be correct and will result in drive noise and premature failure.

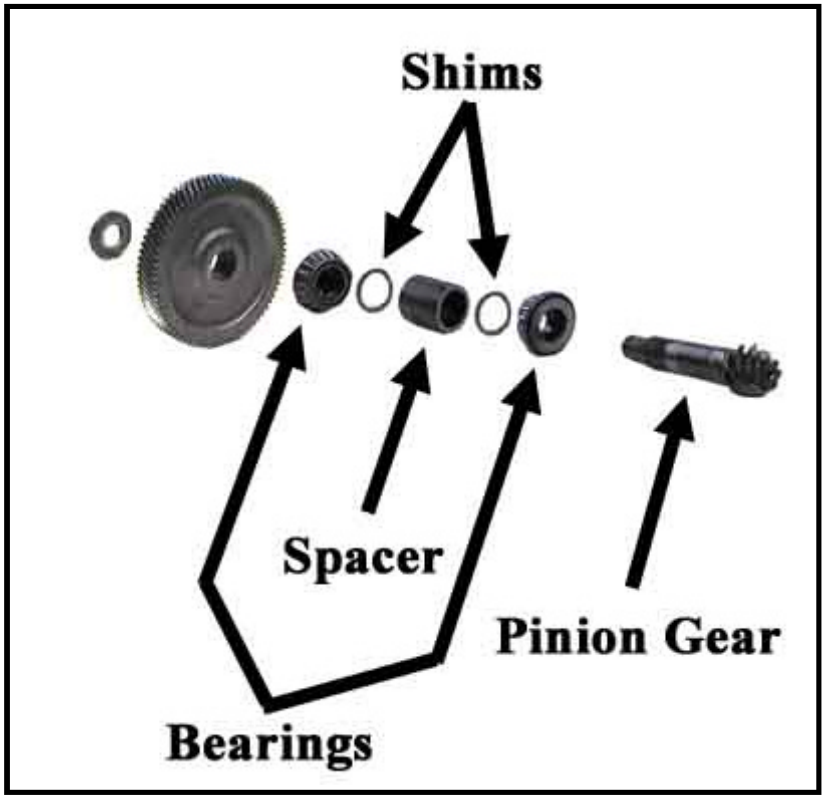
17. Install the locking roll pins into the housing and cover to lock the ring nuts in place.
18. Remove the pinion gear holding tool.
19. Install the primary reduction gear case, axles and housings, motor, and install the complete drive onto the vehicle.
20. Fill the drive with oil. Refer to the ***Lube Chart*** section for information regarding type of oil. Refer to ***Change Oil*** section for information regarding the proper oil level..
21. Lower the vehicle.
22. Reconnect the main positive and negative cables at the batteries.
23. Remove the blocks from behind the wheels.
24. Test drive the vehicle.

Pinion Bearing Preload

NOTE: The pinion gear depth must be set before the preload. Refer to **Setting the Pinion Gear Depth**.

1. Install the pinion gear, spacer, and shims into the housing.
2. Install the outer pinion bearing.
3. Install the main gear onto the pinion shaft and torque the pinion nut to 154-169 ft lbs.
4. Measure the torque required to rotate the pinion shaft in the housing.
5. The torque required to rotate the pinion shaft should be between 1.1 and 2.9 ft-lbs. If the torque is not within specifications then add or subtract from the total shim thickness and repeat this procedure until the proper preload is obtained.

   NOTE: Add shims to decrease torque.



PINION GEAR SHIMMING INSTRUCTIONS

NOTE: This procedure is required only when replacing the front or rear pinion bearings and races or the ring and pinion gears.

NOTE: To perform this procedure, all parts must be clean and the bearings lightly lubricated.

Setting the Pinion Gear Depth

This formula is used to calculate the amount of shims that are required:

C - B - A + (DV) = Pinion Shim (mm) where,

DV = The number on the face of the pinion gear.

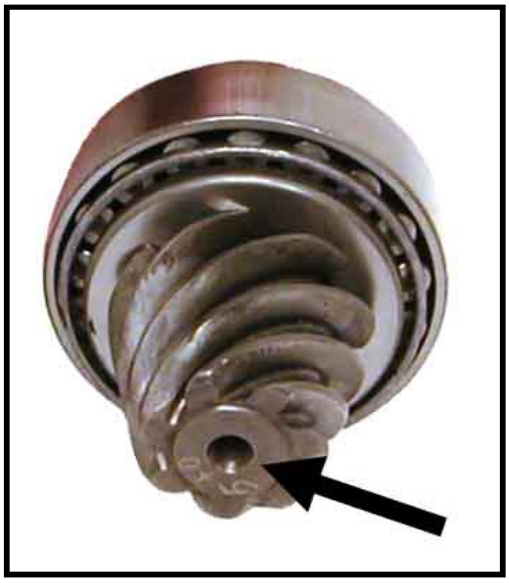
A = The distance in millimeters from the face of the pinion gear to the top of the inner pinion bearing race (see below)

B = 54.

C = The number on the edge of the differential side plate closest to the input shaft (see next page).

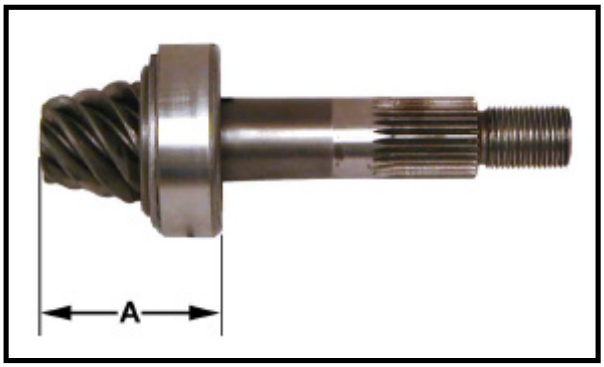
D = The number on the edge of the differential side plate farthest from the input shaft (see next page).

E = The distance in millimeters from the rear of the drive housing to the face of the pinion gear (see next page).

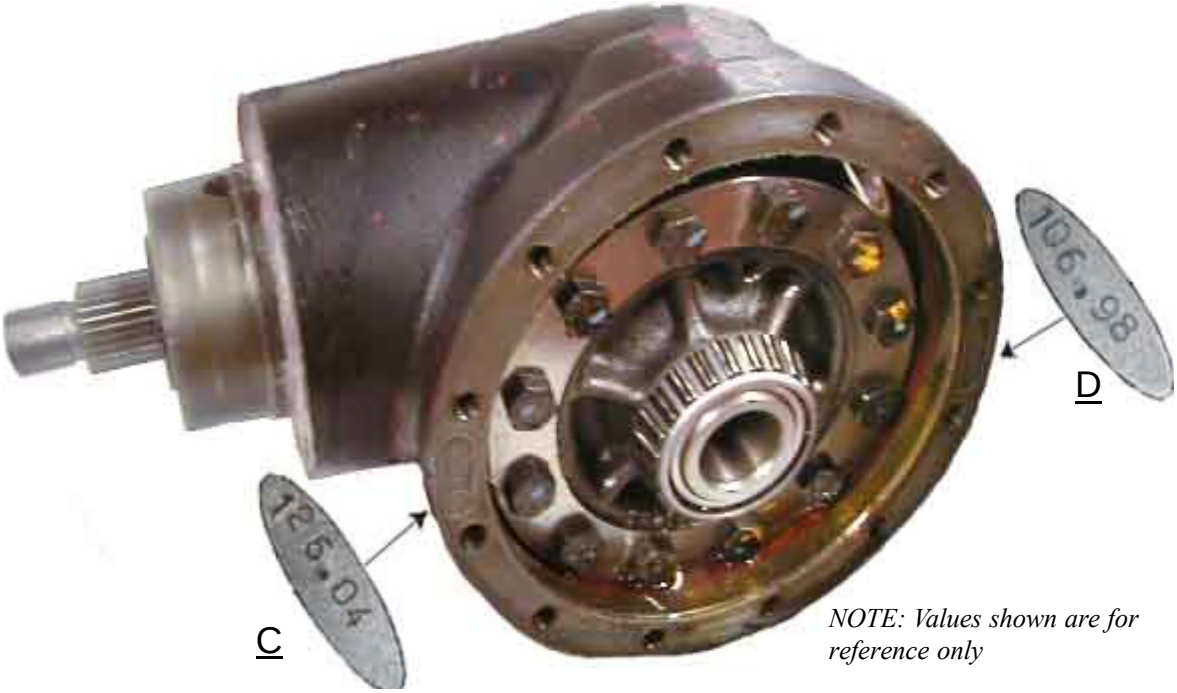


Face of pinion gear

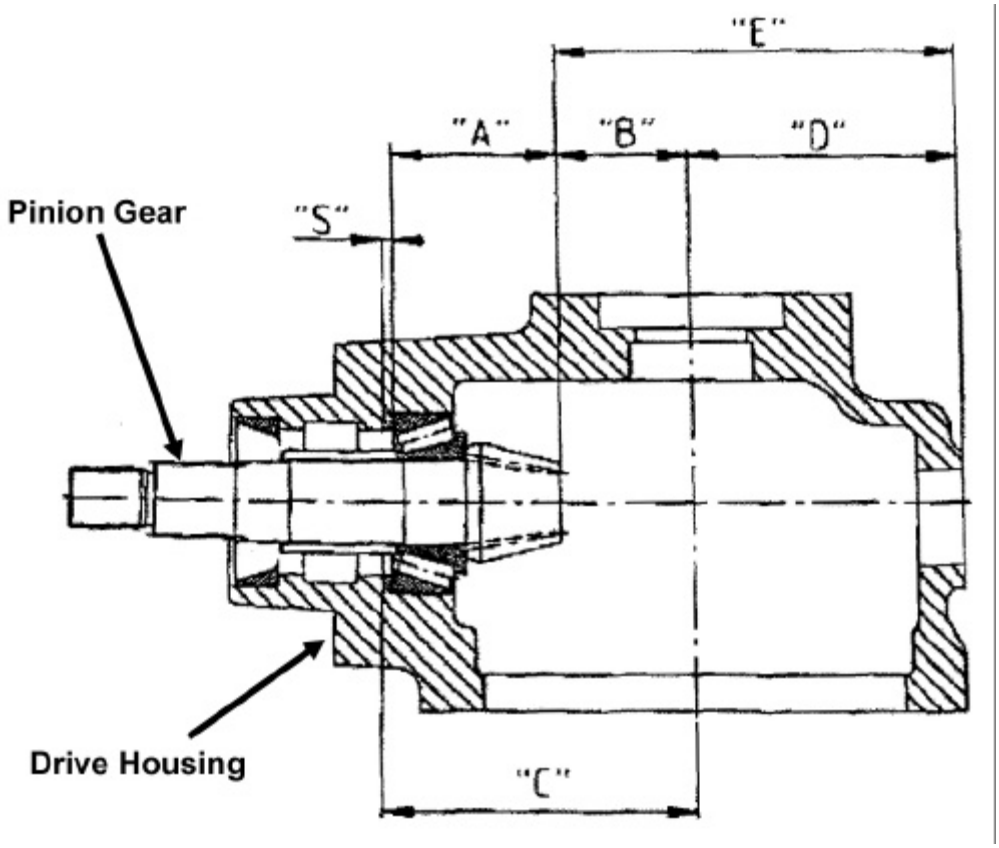
Once a shim has been selected and the pinion gear is installed, confirm that: **E - D = B + (DV)**



Number on face of pinion gear



NOTE: Values shown are for reference only



Suspension

TABLE OF CONTENTS

Replace the Rear Springs 2
Replace the Front Springs 3
Replace the Spring Bushings 4
Replace the Shocks 5

REPLACE THE REAR SPRINGS

If a spring has failed or is fatigued, then it is recommended that both rear springs are replaced as a set.

HINT : In most vehicles it will be easier if the springs are replaced one at a time.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the rear of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Tie up or support the rear axle so it cannot fall out of the vehicle.
8. Unbolt the spring from the axle housing.
9. Support the spring so that it cannot fall out of the vehicle.
10. Remove the remaining hardware retaining the spring to the frame.
11. Remove the spring from the vehicle.
12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.

⚠WARNING

Damaged or worn spring bolts or hangers could result in sudden failure of the suspension causing severe bodily injury or property damage.

13. Install the new spring in reverse order.
14. If the spring hanger bolts do not have a grease fitting, lube the spring bushings before installing the spring.
15. Tighten the spring hanger bolts securely, but not so tight as to bind the spring.
16. Lower the vehicle.
17. Reconnect the main positive and negative cables at the batteries.
18. Remove the blocks from behind the wheels.
19. Release the parking brake and test drive the vehicle.

REPLACE THE FRONT SPRINGS

If a spring has failed or is fatigued, then it is recommended that both front springs are replaced as a set.

HINT : In most vehicles it will be easier if the springs are replaced one at a time.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the rear wheels to prevent vehicle movement.

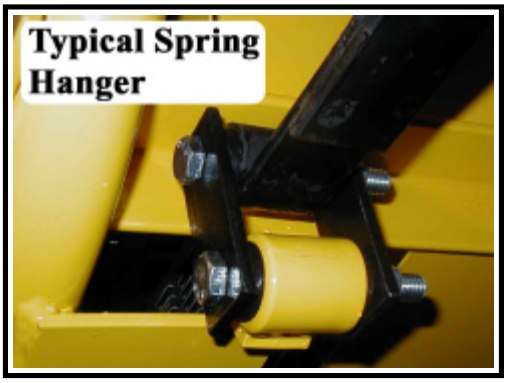
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front of the vehicle and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily injury.

7. Tie up or support the front axle so it cannot fall out of the vehicle.
8. Unbolt the spring from the front axle beam.
9. Support the spring so that it cannot fall out of the vehicle.
10. Remove the lower bolt from the spring hanger.
11. Remove the spring bolt from the other end of the spring and remove the spring from the vehicle.
12. Inspect the spring bolts and spring hangers for signs of wear or damage. If any wear or damage is found, then they must be replaced.
13. Install the new spring in reverse order.
14. If the spring hanger bolts do not have a grease fitting, lube the spring bushings before installing the spring.
15. Torque the spring hanger bolts to 20 ft-lbs.
16. If the spring bolts are equipped with grease fittings, lube them at this time.
17. Lower the vehicle.
18. Reconnect the main positive and negative cables at the batteries.
19. Remove the blocks from behind the wheels.
20. Release the parking brake and test drive the vehicle.



⚠WARNING

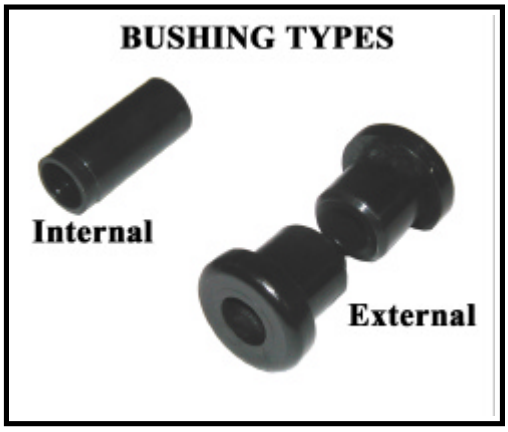
Damaged or worn spring bolts or hangers could result in sudden failure of the suspension causing severe bodily injury or property damage.

REPLACE THE SPRING BUSHINGS

It is recommended that all front spring bushings are replaced as a set.

Your vehicle will be equipped with one of two types of spring bushings, internal and external (see illustration to the right):

- The internal bushing is a plastic insert that is pressed into the spring eye. There are one of these bushings for each spring eye.
- The external bushing consists of two plastic bushings on each end of the spring eye.
- Refer to the parts list to identify the bushings used in your vehicle.



⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front/rear wheels to prevent vehicle movement.

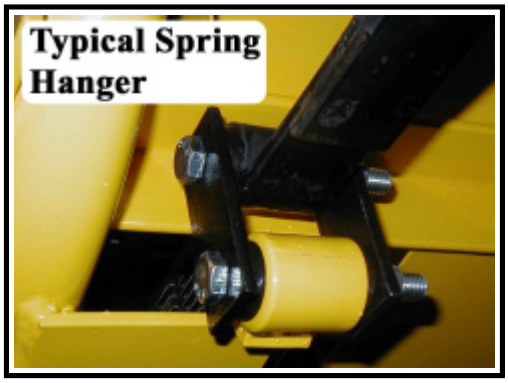
5. Disconnect the main positive and negative cables at the batteries.

6. Raise the front or rear of the vehicle depending on which spring is to be removed and support with jack stands.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily

7. Remove the spring from the vehicle.
   NOTE: Refer to **Replace the Front Springs** *section for information regarding removing the front springs.*
8. If the vehicle is equipped with spring hangers, remove the spring hanger bolt from the vehicles frame.
9. Remove the spring bushing(s):
   - For internal bushing, press the spring bushings out of the two spring eyes and from the mounting eye on the vehicles frame.
   - For external bushing, Remove the bushings from the spring eye.
10. Install the new bushings in reverse order.



REPLACE THE SHOCKS

It is recommended to replace all shocks as a set.

NOTE: On some vehicles it may be required to remove the front wheel to gain access to the shock mounting bolts. Refer to **Tires and Wheels** *section for information regarding removing the front wheels.*

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Some vehicles may require that the wheels be lifted off of the ground and supported with jack stands to replace the shocks.

⚠WARNING

Always use a lifting strap, hoist, and jack stands, of adequate capacity to lift and support the vehicle. Failure to use lifting and support devices of rated load capacity may result in severe bodily

7. Remove the upper and lower shock bolts.
8. Remove the shock from the vehicle.

   NOTE: If the shock that was removed is to be reinstalled:

   A. Inspect the shaft where it enters the shock body for any signs of leakage. If any sign of leakage is seen, then the shock must be replaced.

   B. Inspect the upper and lower shock bushings. If any signs of damage or wear are seen, then the shock must be replaced.

9. Install the shock in reverse order.
10. Lower the vehicle.
11. Reconnect the main positive and negative cables at the batteries.
12. Remove the blocks from behind the wheels.
13. Release the parking brake and test drive the vehicle.

TAYLOR - DUNN

Tires and Wheels

TABLE OF CONTENTS

Tire Inflation 2
Tire Inspection 2
Replace the Tire/Wheel 3
Repair the Tire (pneumatic) 4
Replace the Tire (pneumatic) 5

TIRE INFLATION

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

There are many tire options available with varying tire pressures. Refer to the side wall of your tire for information regarding the tire pressure for your tires.

The illustration to the right is an example of the side wall information on a tire.

Tire pressures must be checked when the tire is cold.

TIRE INSPECTION

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Check the tire pressure. Refer to ***Tire Inflation*** section for information on checking the tire pressure.
7. Inspect the tire tread depth. Minimum recommended tread depth is 1/16-inch. There are a series of tread depth wear indicators around the circumference of the tire. They will appear as 1/2-inch bands across the tread as the tire approaches its wear limit (see illustration to the right). Replace the tire if any tread depth indicator can be seen or any part of the tread depth is 1/16-inch or less. Refer to ***Replace the Tire*** section for information regarding replacing the tire.

8. Inspect for uneven tire wear on the front tires. Uneven tire wear could be a result of an improperly inflated tire or a misaligned or damaged front end.
   NOTE: Refer to **Tire Inflation** *section or* **Steering Component Service** *section for information on proper tire inflation or front end wheel alignment.*
9. Inspect the inner and outer side walls for cracks. If any cracks are seen, then the tire should be replaced. Refer to ***Replace the Tire*** section for information regarding replacing the tire.
10. Inspect the valve stem for cracks. If any cracks are seen, then the valve stem should be replaced. It is also recommended that the valve stem be replaced whenever the tire is replaced.
    NOTE: Refer to **Replace the Tire** *section for information regarding replacing the valve stem.*
11. Inspect the tread and side walls for debris in the rubber that could lead to a puncture. If any debris is found it should be removed and the tire inspected for a leak.

REPLACE THE TIRE/WHEEL

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

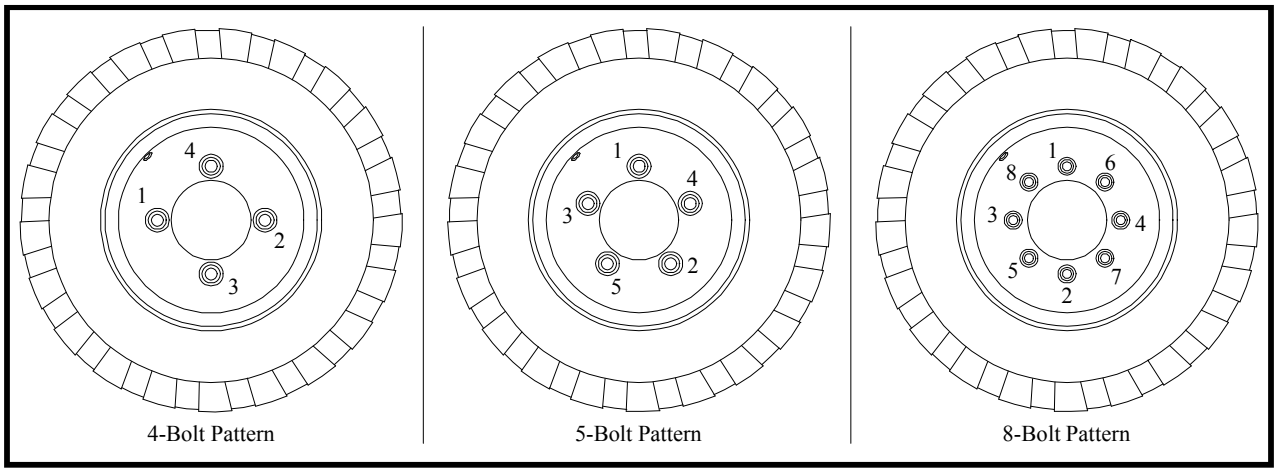
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Raise the wheel to be replaced off of the ground and support with jack stands.
7. Remove the 4 or 5 wheel nuts and remove the wheel.
8. Install in reverse order.
9. Following the pattern shown on the following page, cross tighten the wheel nuts in two stages as follows:
   1st stage to approximately 20 ft-lbs.
   2nd stage to 80-90 ft-lbs.
10. Reconnect the main positive and negative cables at the batteries.
11. Lower the wheel to the ground.
12. Remove the blocks from behind the wheels.
13. Release the parking brake and test drive the vehicle.



Pattern for tightening the wheel nuts

⚠WARNING

Re-torque all wheel nuts to their final value after 1-week (20-hours) of operation. Failure to re-torque the wheel nuts may result in the wheel coming off of the vehicle causing severe bodily injury and/or property damage.

REPAIR THE TIRE (PNEUMATIC)

⚠WARNING

Do not attempt to repair a tire with a damaged side wall or a slice in the tread. This type of repair could fail prematurely resulting in severe bodily injury and/or property damage.

NOTE: To properly repair a puncture, the tire must be removed from the wheel. Refer to **Replace the Tire** *section for information on removing the tire from the wheel.*

It is recommended to repair a tire with a combination vulcanized plug and internal patch.

Tire repairs should only be performed by personnel trained in tire repair.

The tire repair procedure will be unique to the type of repair equipment or repair components used. Refer to the instructions provided with your equipment or repair components.

REPLACE THE TIRE (PNEUMATIC)

NOTE; To replace the tire, the tire/wheel assembly must be removed from the vehicle. Refer to **Replace the Tire/Wheel** *section for information on removing the tire/wheel assembly.*

⚠WARNING

Explosion Hazard. Fully deflate the tire before attempting to remove the tire from the wheel. Do not over inflate the tire when seating the bead. Failure to deflate the tire or over inflating the tire to seat the bead may cause explosive failure of the tire resulting in severe bodily injury or death.

Tire replacement should only be performed by personnel trained in tire replacement.

The tire replacement procedure will be unique to the type of replacement equipment being used. Refer to the instructions provided with your equipment.

Always use a new valve stem when replacing a tire.

1. Remove the tire from the wheel.
2. Cut the old valve stem off of the wheel.
3. Remove the valve stem cap from the new valve stem.
4. Lubricate the valve stem with liquid soap.
5. Install a new valve stem using a valve stem tool.
   NOTE: The valve stem tool is available at most auto repair shops.
6. Install the tire onto the wheel following the instructions provided with your tire replacement equipment.
7. Inflate the tire to the proper pressure and check for leaks.
8. Install the valve stem cap.

TAYLOR - DUNN

Battery Service

TABLE OF CONTENTS

Cleaning 2
Testing 3
Watering 5
Charging 6
Replacing (6-volt batteries only) 7
Moist Charge Batteries 9
Storage and Returning to Service 10
Storage 10
Returning to Service 11

CLEANING

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Dry dirt can be readily blown off with low-pressure air or brushed off.
7. Wetness or wet dirt on the batteries indicates battery acid. Using a nonmetallic brush with flexible bristles, wash the batteries off with a strong solution of baking soda and hot water (1 lb. of soda to a gallon of water). Continue until all fizzing stops, which indicates that the acid has been neutralized. Then rinse thoroughly with clear water. DO NOT get any of the solution into the battery cells.
8. Reconnect the batteries, remove the blocks from the wheels and test drive.

TESTING

NOTE: A combination of the Load Test and Specific Gravity Test should be used to accurately determine the condition of the batteries.

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

Load Test (6-volt batteries only)

NOTE: The batteries must be fully charged before performing this test.

1. Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.
2. Load test each battery using a battery load test meter (available at most auto parts distributors). Follow the instructions provided with the test meter.
   - If any battery fails the load test, then it should be replaced.

     NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

   - If all batteries fail the test you should check the charging system before replacing the batteries. Refer to ***Charger Troubleshooting*** section for information on checking the charging system.

Specific Gravity Test

NOTE: The batteries must be fully charged before performing this test.

The specific gravity of a cell is an indication of the actual state of charge of the cell. A fully charged cell should have a reading of 1275 to 1300 (see the illustration to the right). A discharged battery will read 1100. Ideally, all cells in a battery pack will have the same reading. Any cells in a battery pack that vary by more than 30-points may be an indication of a bad cell.

Typical Hydrometer Float

Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.

Using part number **77-200-00** hydrometer, check and record the specific gravity of each cell in the battery pack.

If, after charging, none of the cells exceed a hydrometer reading of 1250 then there may be a fault in the charging system. If the charging system checks OK then the batteries are no longer accepting a charge and should be replaced.

NOTE: Refer to **Charger Troubleshooting** *for information on checking the charging system.*

The highest reading will be the cell that is accepting the most charge. This reading will be used to gauge all other cells.

Compare the specific gravity readings to the highest reading, if the difference between any of the cells is more than 30-points, then that battery should be replaced.

NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

Reconnect the batteries, remove the blocks from the wheels and test drive.

WATERING

NOTE: The electrolyte level in a battery rises while charging and will be close to its highest level after the end of a charging cycle. It is recommended to fill the batteries at the end of a charging cycle. If the electrolyte is below the top of the battery plates then fill just enough to cover the plates and then top off when the charging cycle is complete.

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe bodily injury and/or property damage.

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in severe bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in severe bodily injury and/or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

⚠WARNING

Do not overfill the batteries. Over filling the batteries may cause the batteries to boil over and result in severe bodily injury or property damage.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

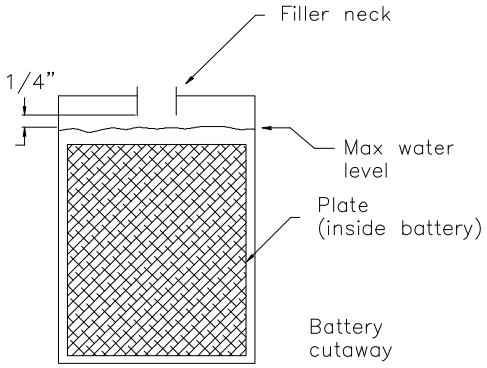
2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

6. Clean the batteries. Refer to ***Cleaning the Batteries*** section for information on cleaning the batteries.
7. Check the electrolyte level in all battery cells. If low, fill to the correct level with distilled water using part number **77-201-00** battery filler, never add additional battery electrolyte to the batteries.
8. Reconnect the batteries, remove the blocks from the wheels and test drive.



CHARGING

Refer to ***Charging Your Vehicle*** in section ***Safety Rules and Operating Instructions***.

REPLACING (6-VOLT BATTERIES ONLY)

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.

2. Place the forward-reverse switch in the center "OFF" position.

3. Set the park brake.

4. Place blocks under the front wheels to prevent vehicle movement.

5. Disconnect the main positive and negative cables at the batteries.

NOTE: If the batteries are over one year old, it is recommended to replace them as a set.

6. Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

7. Remove the battery hold downs.
8. Inspect the battery hold downs for corrosion. If any signs of corrosion are seen then the battery hold downs should be replaced.
9. Remove all battery jumpers from both posts of the battery or batteries being replaced.

   NOTE: It is recommended to replace the battery jumpers when replacing the batteries.

10. Remove the batteries from the vehicle.

⚠WARNING **Do not leave cables on batteries that have been removed from the vehicle. Cables left on batteries could cause a short circuit resulting in battery explosion, severe bodily injury and/or property damage.**

11. Inspect the battery compartment for signs of corrosion.
12. If minimal signs of corrosion are seen, then the damaged paint should be stripped off and the entire battery compartment prepped and repainted.
13. If there are excessive signs of corrosion, then it may be necessary to replace some of the frame members or completely rebuild the battery compartment.
14. Inspect the main positive and negative cables and terminals, charger cables and terminals and 12-volt tap wiring. If any of the terminals or wires show signs of corrosion, then they must be repaired or replaced.
15. Install the batteries in reverse order. Refer to the ***Illustrated Parts List*** for battery cable routing.
16. It is recommended to replace the battery terminal hardware when replacing the batteries.
17. Torque the terminal hardware to 7-8 ft.-lbs.
18. Tighten the hold downs so that the batteries are secure but not so tight as to deform the batteries.

⚠CAUTION **When torquing battery hardware, use a backup wrench on the battery bolt and tighten the nut. Failure to use a backup wrench may damage the battery post.**

19. Remove the blocks from the wheels and test drive.

Moist Charge Batteries

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

Moist charged batteries are shipped without battery electrolyte. This allows for a much greater shelf life of the battery. Moist charged batteries must be filled with electrolyte and charged before putting into service. Battery electrolyte is a solution of acid and water that is formulated to be used in wet lead acid batteries and is available at most automotive parts distributors that carry batteries.

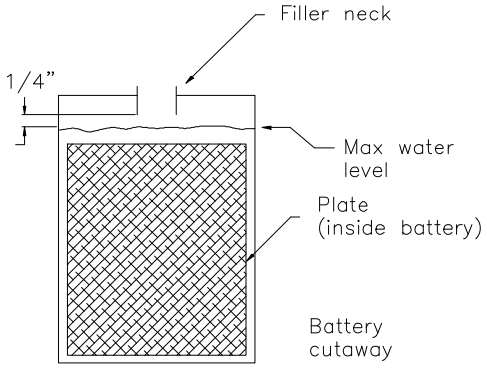
⚠CAUTION

Do not operate or charge a vehicle equipped with moist charged batteries until the batteries have been filled with electrolyte and charged. Operating or charging moist charged batteries before filling and charging will damage the batteries resulting in premature failure of the batteries.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Fill all battery cells with electrolyte to the proper level.
7. Thoroughly clean any spilled electrolyte from the batteries or the ground. Refer to ***Cleaning the Batteries*** for information on cleaning the batteries.
8. Reconnect the battery cables, connect the batteries to the charger and allow the charger to complete one charging cycle.
9. Remove the blocks from the wheels and test drive. The batteries are now ready to be put into service.



⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

STORAGE AND RETURNING TO SERVICE

Storage

⚠CAUTION

If the batteries are removed from the vehicle, do not place them directly on the ground, concrete or solid metal surface. It is recommended to store them on a wooden pallet or equivalent. Storing on the ground, concrete or solid metal surface will cause the batteries to discharge and may result in premature failure of the batteries.

Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

Check the electrolyte level and charge the batteries. Refer to ***Watering*** in this section for information regarding checking the electrolyte level.

Store the vehicle or batteries in a cool, dry, well ventilated area.

If storing for more than one month, the batteries should be charged as follows:

Storage Temperature (F)	Charging Interval (months)
Over 60	1
Between 40 and 60	2
Below 40	6

Returning to Service

⚠WARNING

Explosive mixtures of Hydrogen gas are present within battery cells at all times. Do not work with or charge battery in an area where open flames (including gas furnace or water heater pilots), sparks, cigarettes, or any other sources of combustion are present. Always provide ample ventilation in rooms where batteries are being charged. Failure to do so may result in severe property damage and or serious

⚠WARNING

Battery electrolyte is poisonous and dangerous. It contains sulfuric acid. Avoid contact with skin eyes or clothing. Wear rubber gloves and safety glasses while servicing batteries. DO NOT INGEST! This may result in serious bodily injury.

⚠WARNING

A battery is a live electrical source. It cannot be disconnected or neutralized. Do not drop any tool or conductive object onto the battery. A conductive object that comes in contact with the battery terminals will initiate a short circuit of the battery. This could cause the battery to explode resulting in property damage and/or bodily injury.

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**
5. **Disconnect the main positive and negative cables at the batteries.**

6. Thoroughly clean the batteries and battery compartment. Refer to ***Cleaning*** in this section for information regarding cleaning the batteries.

⚠CAUTION

Battery electrolyte will stain and corrode most surfaces. Immediately and thoroughly clean any surface outside of the battery that the battery electrolyte comes in contact with. Failure to clean may result in property damage.

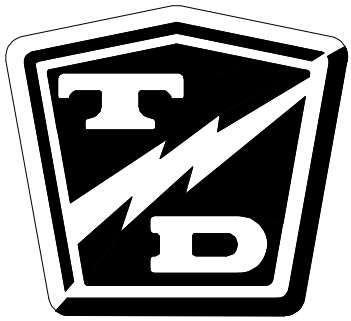
7. Check the electrolyte level and charge the batteries. Refer to ***Watering*** in this section for information regarding checking the electrolyte level.
8. Test the batteries. Refer to ***Testing*** section for information on testing the batteries.
9. The batteries are now ready to be put back into service.

TAYLOR - DUNN

Control System Diagnostics

TABLE OF CONTENTS

Test Equipment Required: 2
Important Notes and Instructions 2
Status LED Code Table 3
Throttle Module Test 6



Rev B

Test Equipment Required:

- User Level Maintenance Handset # 62-027-64
  The Maintenance Handset can view current faults, fault history, monitor all controller inputs and outputs and monitor the current status of the controller, motor, battery and vehicle operation.
  Instruction for using the handset are included with the handset.
- Throttle module test harness #75-089-00.

Important Notes and Instructions

- Troubleshooting this vehicle requires proficiency in the use of standard test equipment such as Volt meters, Ammeters, Ohm meters, etc.
  Troubleshooting this vehicle requires proficiency in testing relating to the continuity of switches, connectors, wiring, etc.
  If the technician working on this vehicle is not proficient in any of the above, diagnostics should be referred to a qualified technician..
- Make sure the batteries are in good condition and fully charged before performing any tests.
- If the vehicle exhibits intermittent problems, it must be in the failed mode for troubleshooting. If it is running normally when the testing is done then the problem will not be identified.

DURING ALL TESTS or REPAIRS.

⚠WARNING

Turn the ON-OFF switch OFF then disconnect both of the battery leads during any maintenance or before disconnecting any electrical component or wire. Failure to do so may cause severe bodily injury and/or property damage.

⚠WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Use lifting and support devices with a minimum capacity of twice the gross weight of your vehicle. Failure to use lifting and support devices of recommended load capacity may result in severe bodily injury.

⚠WARNING

After any repairs are made, completely retest the vehicle before lowering the drive wheels to the ground. Failure to retest the vehicle could result in unexpected movement of the vehicle resulting in severe bodily injury and/or property damage.

Status LED Code Table

The status LED's on the speed controller can be used to give you an idea of where the problem may be. During normal operation (no faults) the yellow LED will be flashing steady.

When the controller senses a fault the two LED's can be used to determine the fault code. The fault code will be a two digit code. The red LED signifies which digit and the yellow LED signifies the fault code. For example: When the red LED flashes once, the yellow LED will be flashing the first digit. When the red LED flashes twice, the yellow LED will be flashing the second digit. The fault code will repeat until the fault is corrected.

Typical location of Status LED's

Code	Handset Display *Effect of Fault*	Possible Cause	Note
12	Controller Overcurent *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake.*	1. External short in motor wiring. 2. Defective controller. 3. Faulty wiring.	
13	Current Sensor Fault *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake.*	1. Short or leakage to frame from motor windings or wiring. 2. Controller defective	
14	Precharge Failed *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake.*	1. External load attached to controller B+ terminal.	*Possible non-factory installed device*
15	Controller Severe Undertemp *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake;* *Shutdown throttle;* *Full Brake.*	1. Vehicle operated in temperatures below -40ºC.	
16	Controller Severe Overtemp *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake;* *Shutdown throttle;* *Full Brake.*	1. Vehicle operated in extreme high ambient temperatures. 2. Vehicle overloaded. 3. Controller not properly mounted.	*Controller overheated (+95ºC)*
17	Severe Undervoltage *Reduced drive torque.*	1. Blown circuit breaker. 2. Battery failure while in operation.	
18	Severe Overvoltage *Shutdown of main contactor;* *Shutdown of motor;* *Shutdown of EM brake;* *Shutdown throttle;* *Full Brake.*	1. Blown circuit breaker during regen. 2. Battery failure during regen.	
21	Controller Undertemp Cutback *Reduced motor torque.*	1. Controller operated in temperatures below -25ºC	*Controller output is reduced below -25ºC*
22	Controller Overtemp Cutback *Reduced drive and brake torque.*	1. Vehicle operated in extreme high ambient temperatures. 2. Vehicle overloaded. 3. Controller not properly mounted.	*Controller overheated (+85ºC)*
23	Undervoltage Cutback *Reduced drive torque.*	1. Batteries discharged. 2. Battery failure.	

Code	Handset Display *Effect of Fault*	Possible Cause	Note
24	Overvoltage Cutback *Reduced brake torque.*	1. Battery failure. 2. High voltage generated during normal regen.	
25	+5-volt Supply Failure *None.*	1. Faulty motor encoder. 2. Faulty wiring	*+5-volt supply at Pin - 26 is too low*
26	Digital Out 6 Overcurrent *Digital output 6 will not turn on*	1. Load on output #6 exceeded 0.015 Amps.	*Not used – If fault occurs then check controller connector for contamination*
27	Digital Out 7 Overcurrent *Digital output 7 will not turn on*	1. Load on output #7 exceeded 0.015 Amps.	*Not used – If fault occurs then check controller connector for contamination*
28	Motor Temp Hot Cutback *Reduced drive torque.*	1. Vehicle operated in extreme high ambient temperatures. 2. Vehicle overloaded.	*Motor overheated*
29	Motor Temp Sensor Fault *MaxSpeed reduced, Limited Operating Strategy (LOS) and motor temperature cutback disabled.*	1. Motor temperature sensor fault. 2. Wiring Fault.	
31	Main Open/Short *Shutdown Driver 1;* *Shutdown of motor;* *Shutdown of EM brake.*	1. Faulty main contactor coil. 2. Faulty wiring.	
32	EM Brake Open/Short *Shutdown Driver 2;* *Shutdown Throttle;* *Full brake.*	3. Faulty motor brake. 4. Faulty wiring.	
33	Coil3 Driver Open/Short *Shutdown driver 3.*	1. See note.	*Not used – If fault occurs then check controller connector for contamination*
35	PD Open/Short *Shutdown PD*	1. See note.	*Not used – If fault occurs then check controller connector for contamination*
36	Encoder Fault *Control mode changed to , Limited Operating Strategy (LOS)*	1. Faulty motor encoder. 2. Faulty wiring.	
37	Motor Open *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake.*	1. Open motor windings. 2. Faulty wiring.	
38	Main Contactor Welded *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake*	1. Main contactor welded. 2. Motor phase 'U' open circuit. 3. Short to B+ controller terminal. 4. Faulty wiring.	
39	Main Contactor Did Not Close *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake*	1. Faulty main contactor. 2. Faulty wiring. 3. B+ Circuit breaker blown.	
41	Throttle Wiper High *Shutdown throttle.*	1. Faulty throttle module. 2. Faulty wiring.	*Voltage from throttle module too high*
42	Throttle Wiper Low *Shutdown throttle.*	1. Faulty throttle module. 2. Faulty wiring.	*Voltage from throttle module too low*
43	Brake Wiper high *Full brake.*	1. See note, voltage too high on pin-17.	*Not used – If fault occurs then check controller connector for contamination*

Code	Handset Display *Effect of fault*	Possible Cause	Note
44	Brake Wiper Low *Full brake.*	1. See note, voltage too low on pin-17	*Not used – If fault occurs then check controller connector for contamination*
45	Pot Low Overcurrent *Shutdown throttle;* *Full brake.*	1. Current into pin-18 exceeded 0.010A	*Not used – If fault occurs then check controller connector for contamination.*
46	EEPROM Failure *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake;* *Shutdown Throttle;* *Shutdown interlock* *Shutdown Driver 1;* *Shutdown Driver 2;* *Shutdown Driver 3* *Shutdown Driver 4;* *Shutdown PD;* *Full brake.*	1. Controller parameters corrupted.	*Controller must be returned to factory for reprogramming.*
47	HPD/Sequencing Fault *Shutdown throttle.*	1. Startup switches not operated in the correct order. 2. Faulty wiring or switches.	*Refer to operator section for correct startup sequence.*
49	Parameter Change Fault *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake.*	1. May occur when adjusting parameters.	*Cycle key switch to clear fault.*
68	VCL Runtime Error *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake;* *Shutdown Throttle;* *Shutdown interlock* *Shutdown Driver 1;* *Shutdown Driver 2;* *Shutdown Driver 3* *Shutdown Driver 4;* *Shutdown PD;* *Full brake.*	1. Controller parameters corrupted.	*Controller must be returned to factory for reprogramming.*
69	External Supply Out of Range *None.*	1. Faulty wiring. 2. Faulty motor encoder. 3. Faulty dash display.	*Excessive combined current into pin-26 and pin-25.*
71	OS General *Shutdown main contactor;* *Shutdown motor;* *Shutdown EM bake;* *Shutdown Throttle;* *Shutdown interlock* *Shutdown Driver 1;* *Shutdown Driver 2;* *Shutdown Driver 3* *Shutdown Driver 4;* *Shutdown PD;* *Full brake.*	1. Internal controller fault.	*If cycle key switch does not clear fault, controller may have failed.*
72	PDO Timeout *Shutdown interlock;* *CAN NMT State set to Pre-operational*	1. Internal controller fault.	*Cycle key switch to clear fault.*
73	Stall Detect *Control mode changed to LOS.*	1. Stalled motor. 2. Faulty motor encoder. 3. Faulty wiring to encoder. 4. Encoder power supply fault.	*Encoder power supply is provided by pin-26 from controller.*

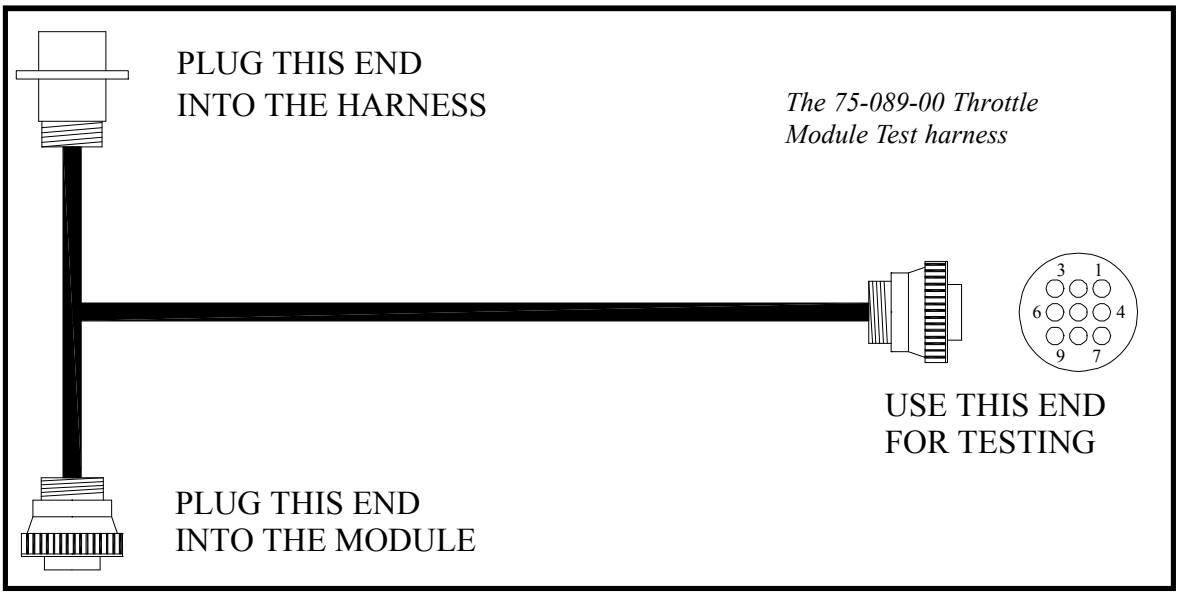
THROTTLE MODULE TEST

Disconnect the truck harness from the throttle module. Connect the plug on the short end of the 75-089-00 test harness to the throttle module. Connect the receptacle on the short end of the test harness to the vehicles control harness. The long end of the harness will be used for testing. Refer to the illustration below.

Testing must be performed in the order shown.

➡ ***This testing cannot be completed without the 75-089-00 test harness.***

Unless specified otherwise, all references to a pin # is referring the connector on the long end of the test harness. Refer to the illustration for the pin locations in the connector. The pin numbers are cast into the connector as shown in the illustration.



⚠WARNING

The rear drive wheels may rotate during some of the following tests. Block the front wheels, raise the rear drive wheels off the ground, and support the vehicle with jack stands. Failure to do so may cause the vehicle to move and cause severe bodily injury and/or property damage.

Use lifting and support devices with a minimum capacity of twice the gross weight of your vehicle. Failure to use lifting and support devices of recommended load capacity may result in severe bodily injury.

⚠WARNING

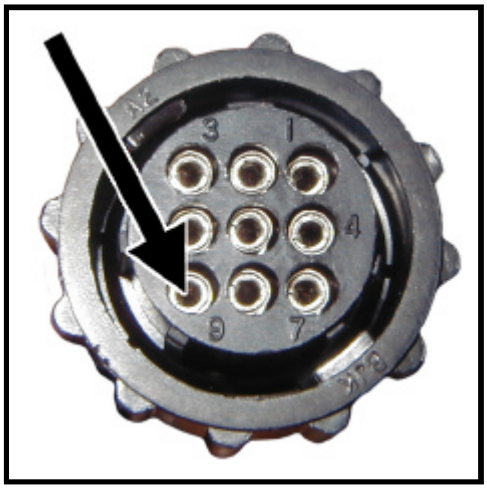
After any repairs are made, completely retest the vehicle before lowering the drive wheels to the ground. Failure to retest the vehicle could result in unexpected movement of the vehicle resulting in severe bodily injury and/or property damage.

All tests performed with the ON-OFF Switch switch in the ON position.

Accelerator pedal depressed meas to depress the accelerator pedal fully (full speed).

Accelerator pedal released means to completely release the accelerator pedal (off).

TEST 1:



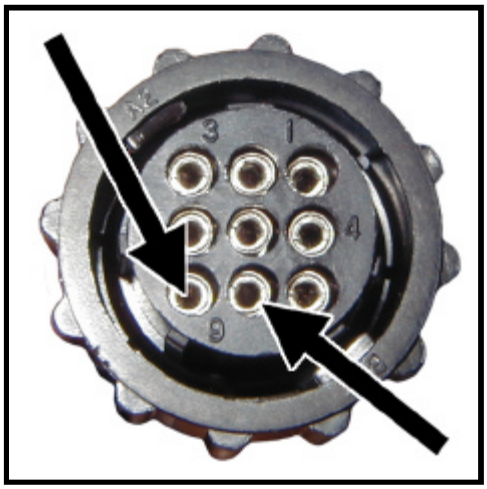
Accelerator pedal released.

Test the voltage from pin #9 to battery positive.

If the voltage equals battery volts ,then skip ahead to test #2.
If the voltage does not equal battery volts, then check the wire from pin #9 to the battery voltage negative circuit breaker.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TEST 2:



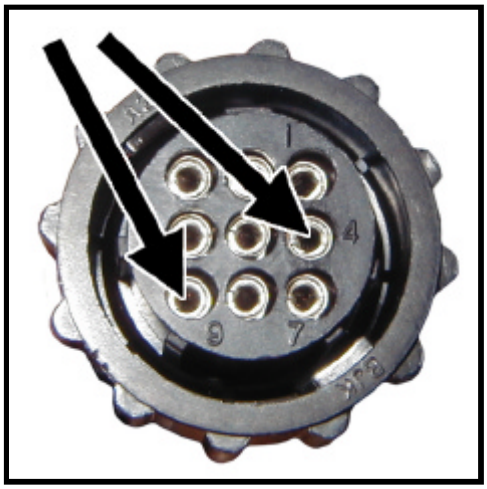
Accelerator pedal released.

Test the voltage from pin #9 to pin #8.

If the voltage equals battery volts, then skip ahead to test #3.
If the voltage does not equal battery volts, then check the wire from pin #8 to the ON-OFF switch.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TEST 3:



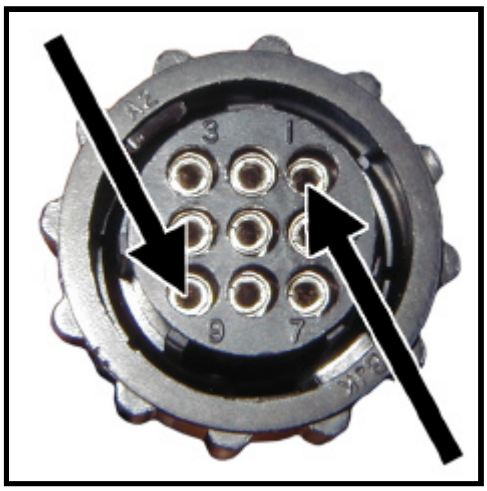
Accelerator pedal released.

Test the voltage from pin #9 to pin #4.

If the voltage equals battery volts, then skip ahead to test #4.
If the voltage does not equal battery volts, then check the wire from pin #4 to the start switch.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TEST 4:



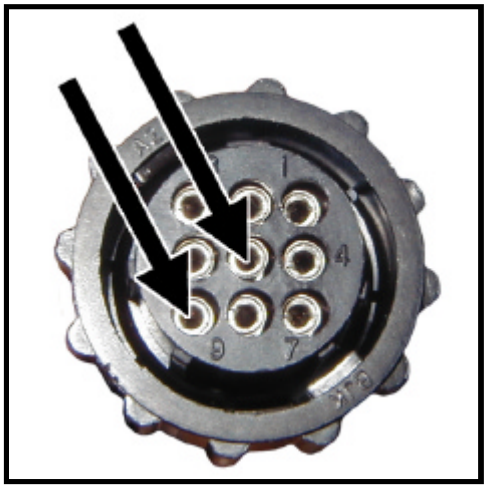
Accelerator pedal released.

Test the voltage from pin #9 to pin #1.

If the voltage is below 0.3 volts, then skip ahead to test #5.
If the voltage is above 0.3 volts, then the module has failed and must be replaced.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TEST 5a:



Test the voltage from pin #5 to pin #9.

Accelerator pedal released.

If the voltage is low then skip ahead to test 5b.
If the voltage is high then then the module has failed.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

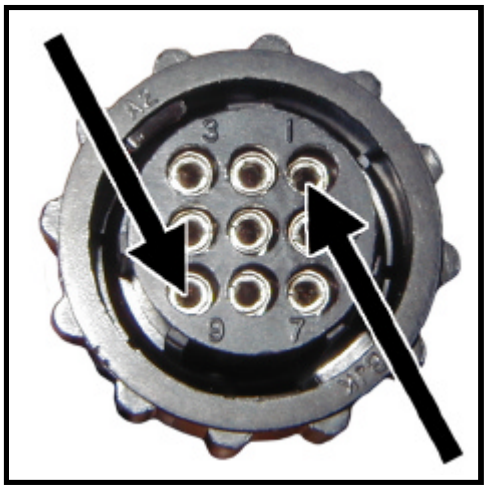
TEST 5b:

Accelerator pedal depressed.

If the voltage equals battery volts, then skip ahead to test #6.
If the voltage does not equal battery volts, then the module has failed or the accelerator pedal return spring on the module is broken.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TEST 6:



Accelerator pedal depressed.

Test the voltage from pin #9 to pin #1.

If the voltage is between 4.8 and 5.1 volts, then skip ahead to test #7.
If the voltage is not between 4.8 and 5.1 volts, then the module has failed and must be replaced.

Stop trouble shooting here and repair the problem. When the repair is completed, completely retest the vehicle before lowering the drive wheels to the ground.

TAYLOR - DUNN

Lestronic II® Charger Troubleshooting

TABLE OF CONTENTS

Operating Instructions and Theory of Operation 2
Testing the Charging Cycle 3
Test Equipment Required for Troubleshooting 4
Important Notes and Instructions ---------- 4
Troubleshooting for Built-in Charger 5
Troubleshooting for Portable Charger 8
Testing The Timer Relay 9
Testing the Interlock Relay 10

⚠CAUTION

Turn the Key switch OFF <u>BEFORE</u> disconnecting the batteries. Disconnecting the batteries with the key switch ON may corrupt the controller programming resulting in a fault code 1 (refer to fault table).

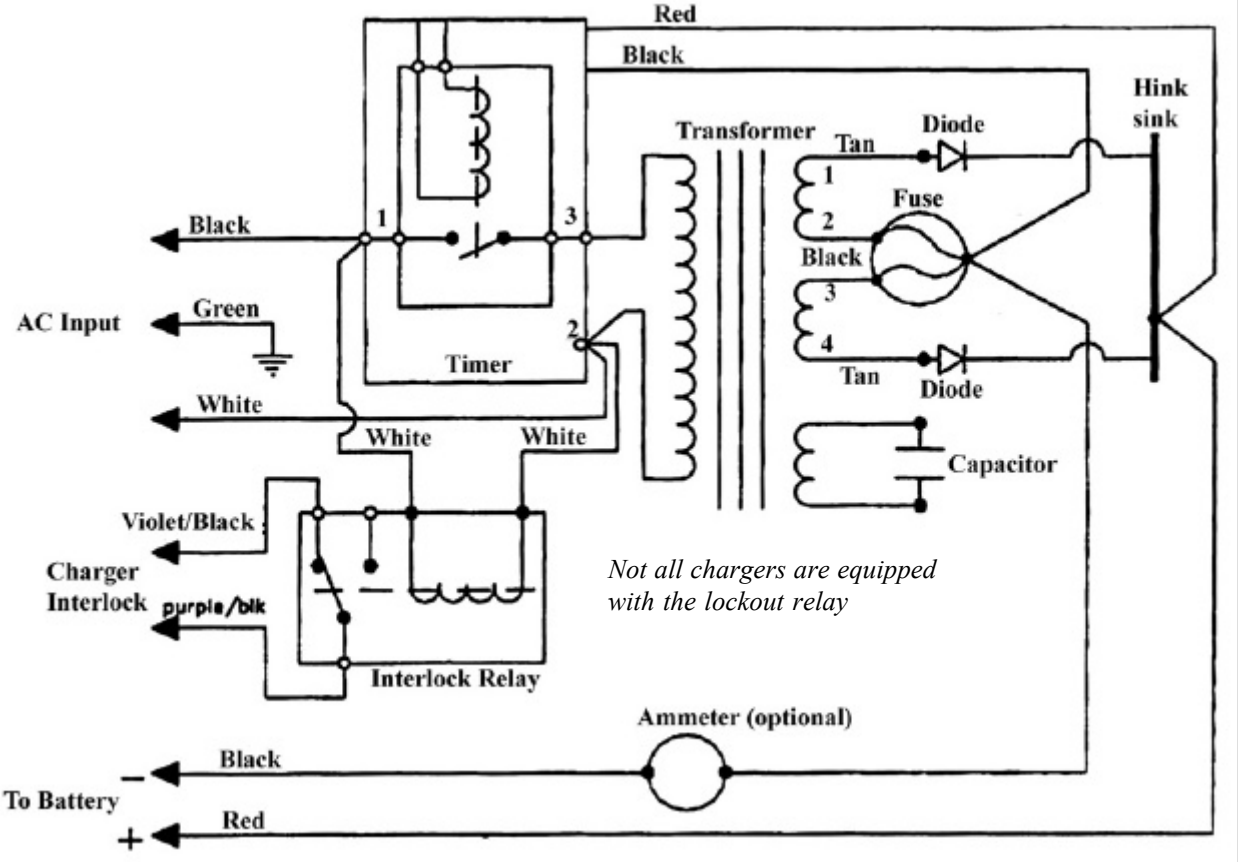
Rev E

OPERATING INSTRUCTIONS AND THEORY OF OPERATION

The Lestronic II® chargers are designed as semiautomatic chargers. The Lestronic II® charger turns itself on when the "built- in" charger is plugged into the wall outlet, or when the "portable" charger is plugged into the batteries. As the battery charges, the battery voltage rises. The charger periodically checks the battery voltage and compares it to the previous reading. When the battery voltage stops rising a predetermined amount, then the batteries are no longer accepting a charge and the charger shuts off. The charger will not start again unless the AC cord on a "built-in" charger is disconnected from the wall outlet, or the DC plug on a portable charger is disconnected from the batteries.

The charger does not check the current state of charge when it is plugged in, it assumes that the batteries require charging when it is connected. For this reason, it is recommended to discharge the batteries approximately 50% (1175-1200 as indicated on a hydrometer) before connecting the charger. If the charger is connected before the batteries are discharged 50%, the batteries may enter an overcharge state before the charger can sense that the batteries are no longer accepting a charge. This could result in overcharging and damaging the batteries.

The relay that operates the charger is powered by the batteries being charged. If the voltage on the batteries to be charged is less than approximately 65% of the rated charger DC voltage, the relay will not pick up and the charger will not turn on. In this situation, a manual charger would have to be used to bring the battery voltage up so that the Lestronic® charger can sense that they are connected and turn itself on.



Typical Charger Internal Wire Diagram

TESTING THE CHARGING CYCLE

In typical installations, the charger will remain on for up to 12 hours depending on the state of charge of the battery when the charge cycle was started.

A charger could remain on for longer than 12 hours if:

- The charging cycle is interrupted at any time during the charging cycle.
- Defective batteries causing a fluctuating DC voltage that confuses the charger.
- A brownout (drop in AC line voltage) during the charging cycle.
- An electrically noisy charging environment.

A charger could turn off in less than 12 hours, but still show symptoms of overcharging if:

- The batteries were not discharged to 50% before connecting the charger.
- The electrolyte in the batteries is too high (boil over).
- The electrolyte in the batteries is too low (excessive gassing or sulfur smell).

To test the charger to see if it is turning off correctly, monitor the battery voltage and the electrolyte specific gravity during the charging cycle as indicated below.

Specific Gravity

Using a hydrometer take the specific gravity reading of several cells, at 1 hour intervals while charging. If the specific gravity of the electrolyte does not rise for three consecutive readings and the charger does not shut off, then the charger is running too long.

Battery Voltage

Using an accurate 5-1/2 digit digital voltmeter, monitor the battery voltage during the charging cycle. Take readings every 30 minutes. If the battery voltage does not increase 0.012 volts in two consecutive readings, then the charger is running too long.

TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING

Digital Multi Meter (DMM) with diode and capacitor test function, FLUKE 79® model shown at right and in the troubleshooting illustrations.

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multimeter including, voltage tests, continuity tests and diode testing. If not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical socket the charger is plugged into is in good working condition.
- Make sure that the AC voltage at the electrical socket is the same as the AC voltage on the charger nameplate.
- Make sure the batteries are in good condition and no less than 80% discharged as per hydrometer reading.
- The battery voltage must be above approximately 65% of the chargers rated DC voltage. If the batteries are below approximately 65% of the chargers rated DC voltage, the charger will not turn on.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting.
- Battery volts = Full voltage available at the batteries at the time of the test being performed.
- This test procedure must be performed in the order it was written. If starting in the middle or skipping sections when not instructed to do so, the proper results will not occur. If the test result is good, then proceed to the next test or go to the next section if instructed to do so.

During All Tests

⚠WARNING

The charger cabinet must remain electrically grounded. Disconnect both of the battery leads and unplug the charger from the AC source before disconnecting any electrical component or wire. Failure to do so may result in serious bodily injury.

TROUBLESHOOTING FOR BUILT-IN CHARGER

⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**

5. Disconnect the charger from the AC source.

Locate the charger harness connectors where the charger harness is connected to the vehicle's control harness. There will be two 10 gauge and two 14 gauge wires.

Slide the insulators off the connectors on the two 10 gauge wires and perform the following tests:

⚠CAUTION

Make sure that these two wires do not come into electrical contact with any other object.

6. Test the voltage from the red wire to the main battery negative. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then this wire is broken or has a bad connection. **Stop here and repair the problem.**

7. Test the voltage from the red 10 gauge wire (+) to the other 10 gauge wire (white or black depending on model). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the white (or black) wire is broken or has a bad connection. **Stop here and repair the problem.**

Slide the insulators back onto the connectors on the two 10 gauge wires.

Slide the insulators off the connectors on the two 14 gauge wires.

⚠WARNING

High Voltage. Do not touch the 14-gauge wires and make sure these two wires do not come into electrical contact with any other object. Failure to do so may result in serious bodily injury.

Re-Connect the charger to the AC source.

8. Test the voltage across the two 14 gauge wires. This voltage should be the same as the voltage at the AC receptacle (rated voltage of the charger). If the voltage is less than the rated AC voltage of the charger then the 14 gauge white or black wire(s) is broken or has a bad connection between the charger connectors and the AC plug. **Stop here and repair the problem.**

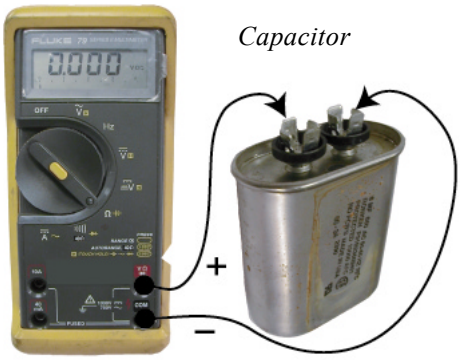
- Disconnect the charger from the AC source.
- Disconnect the batteries.
- Disconnect the charger from the vehicle's harness.
- Remove the charger from the vehicle.

⚠WARNING

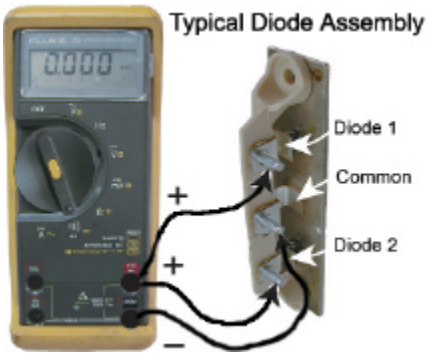
HIGH VOLTAGE may be stored in the capacitor. Discharge the capacitor before continuing. Connect a 2k ohm resistor across the capacitor terminals for 10 seconds. Do not touch the capacitor terminals with your hands. The resistor should be held with a pair of insulated pliers. Failure to do so may cause serious bodily injury

Remove the charger cover and perform the following tests:

1. Inspect the internal wiring of the charger and repair as required.
2. Check the continuity of both fuse links and replace if bad.
3. Disconnect one transformer lead from the capacitor. Test the capacitor using the capacitor test function of the meter. It is a 6 microfarad capacitor. If the capacitor is bad, it must be replaced. **Stop here and repair the problem.**



4. Reconnect the transformer lead to the capacitor and disconnect one transformer lead from one of the diodes. Test each of the diodes using the diode test function of your meter. If either one of the diodes are bad, replace the diode assembly. **Stop here and repair the problem.**



5. Reconnect the lead to the diode.
6. Reconnect the charger to the vehicle's harness and slide the wiring insulators back into place. Connect the charger to the AC source and perform the following tests:

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Failure to do so may result in serious bodily injury.

• Test the voltage from the fuse assembly (-) to the diode block (+). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wires from the harness connectors to the charger are bad**. Stop here and repair the problem.**

• Test the voltage across the white and black wires that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger, then the wires from the harness connectors to the charger are bad. **Stop here and repair the problem.**

• If the timer relay does not pickup (click) when the AC source is connected, then the timer control circuit or the relay is bad (refer to Timer Relay Test). **Stop here and repair the problem.**

• Test the AC voltage across the transformer primary circuit. The transformer primary consists of the two solid wires with the brown fiber insulator that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger, then the timer relay is bad. **Stop here and repair the problem.**

• Test the AC voltage across the transformer low voltage secondary circuit. The transformer low voltage secondary circuit can be tested at the two solid wires with the brown fiber insulator that are connected to the anodes on the two diodes. The voltage here will vary depending on the state of charge in the batteries. The voltage should be between 208% and 250% of the rated DC voltage of the charger. If the voltage is not between 208% and 250% of the rated DC voltage of the charger, the transformer is bad and must be replaced. **Stop here and repair the problem**.

TROUBLESHOOTING FOR PORTABLE CHARGER

Disconnect the charger from the AC outlet and the batteries.

1. Test the voltage from the positive terminal on the vehicles DC receptacle to main battery negative. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage then this wire is broken or has a bad connection. **Stop here and repair the problem.**

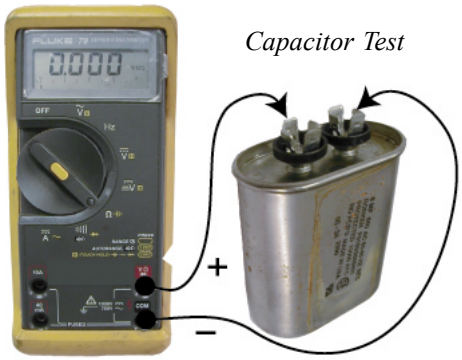
2. Test the voltage from the positive terminal on the DC receptacle to the negative terminal on the DC receptacle. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wire on the negative terminal of the DC receptacle is broken or has a bad connection. **Stop here and repair the problem.**

Remove the charger cover and perform the following tests:

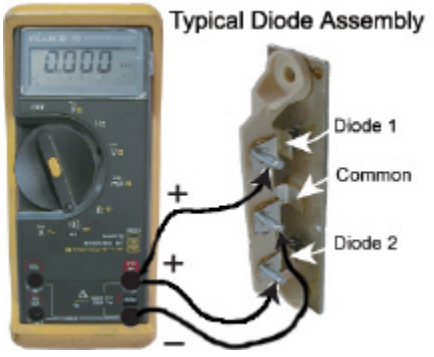
⚠WARNING

HIGH VOLTAGE may be stored in the capacitor. Discharge the capacitor before continuing. Connect a 2k ohm resistor across the capacitor terminals for 10 seconds. Do not touch the capacitor terminals with your hands. The resistor should be held with a pair of insulated pliers. Failure to do so may cause serious bodily injury

1. Inspect the internal wiring of the charger and repair as required.
2. Check the continuity of both fuse links and replace if bad.
3. Disconnect one lead from the capacitor. Test the capacitor using the capacitor test function on the meter. If the capacitor is bad, it must be replaced. **Stop here and repair the problem.**



4. Reconnect the lead to the capacitor and disconnect one transformer lead from one of the diodes. Test each of the diodes using the diode test function on the meter. If either one of the diodes are bad, replace the diode assembly. **Stop here and repair the problem.**



5. Reconnect the lead to the diode.
6. Connect the charger to the AC source. Insert the DC charger plug into the DC receptacle and perform the following tests:

⚠WARNING

High Voltage inside the charger. Do not touch any internal components while the charger is plugged in. Failure to do so may result in serious bodily injury.

- Test the voltage from the fuse assembly (-) to the diode block (+). This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the DC cord is bad. **Stop here and repair the problem.**

- Test the voltage across the white and black wires that are connected to the timer board. This voltage should be the same as the rated AC voltage of the charger. If the voltage is less than the rated AC voltage of the charger then the AC cord is bad. **Stop here and repair the problem**.

- If the timer relay does not pickup (click) within 5 seconds of connecting the DC charger plug, then the timer control circuit or the relay is bad (refer to Timer Relay Test). **Stop here and repair the problem.**

- Test the AC voltage across the transformer primary circuit. This voltage should be the same as the rated AC voltage of the charger. If it is less than the rated AC voltage of the charger, then the timer relay is bad. **Stop here and repair the problem.**

Transformer Secondary Circuit

- Test the AC voltage across the transformer secondary circuit. The voltage here will vary depending on the state of charge in the batteries. The voltage should be between 208% and 250% of the rated DC voltage of the charger. If the voltage is not between 208% and 250% of the charge's rated DC voltage, the transformer is bad and must be replaced. **Stop here and repair the problem.**

TESTING THE TIMER RELAY

Test 1:

1. Connect the batteries to the charger.
2. Plug the charger into the AC source.
3. Wait 5 seconds, then test the voltage at the timer relay coil terminals. NOTE: This voltage should be close to the battery volts.

- If the voltage is close to the battery volts, then skip to test 2.
- If the voltage is not close to the battery volts, then the timer control circuit has failed and the timer must be replaced.

Test 2:

1. Disconnect the batteries.
2. Unplug the charger from the AC source.
3. Discharge the capacitor (see warning on previous page).

4. Disconnect the wires from the contact terminals on the timer relay.
5. Reconnect the batteries.
6. Wait 5 seconds, then test the continuity across the timer relay contact terminals.

- If this is a closed circuit, then the timer start up circuit is functioning normally.
- If there is an open circuit, then the timer relay has failed and the relay must be replaced.

TESTING THE INTERLOCK RELAY

Operation

The Interlock Relay disables the vehicle from running whenever the charger is connected to a working AC power source. When the charger is plugged in, the relay contacts open and break the Key Switch connection to the speed controller. The Interlock Relay is available for built-in chargers only. Not all built-in chargers are equipped with this relay. To identify chargers that are equipped with the Interlock Relay:

Inspect the charger wire harness where it enters the charger cabinet for two Violet/Black wires. If these wires are present then the charger is equipped with the Interlock Relay.

Testing

⚠WARNING

1. Make sure the key-switch is in the "OFF" position, then remove the key.
2. Place the forward-reverse switch in the center "OFF" position.
3. Set the park brake.
4. Place blocks under the front wheels to prevent vehicle movement.
5. Disconnect the main positive and negative cables at the batteries.

6. Disconnect the charger from the AC power source.
7. Disconnect the two Violet/Black wires at the charger harness knife connectors.
8. Set the DMM to check for continuity and connect the DMM leads to the wires going into the charger.
   - The DMM should indicate a closed circuit. If the DMM indicates an open circuit, then the relay or the wires to the relay have failed. **Stop here and repair the problem.**
9. Connect the charger to a working AC power source.
   - The charger should turn on. If the charger does not turn on then their may be a problem with the AC power source or the AC wiring to the charger. Refer to the beginning of this section for charger troubleshooting. DO NOT continue until you have confirmed that the AC power source is working.
   - The DMM should indicate an open circuit. If it still indicates a closed circuit, then the relay or the wires to the relay have failed. **Stop here and repair the problem.**

- If the DMM indicates an open circuit then the interlock relay is functioning normally.

Signet® Charger Troubleshooting

TABLE OF CONTENTS

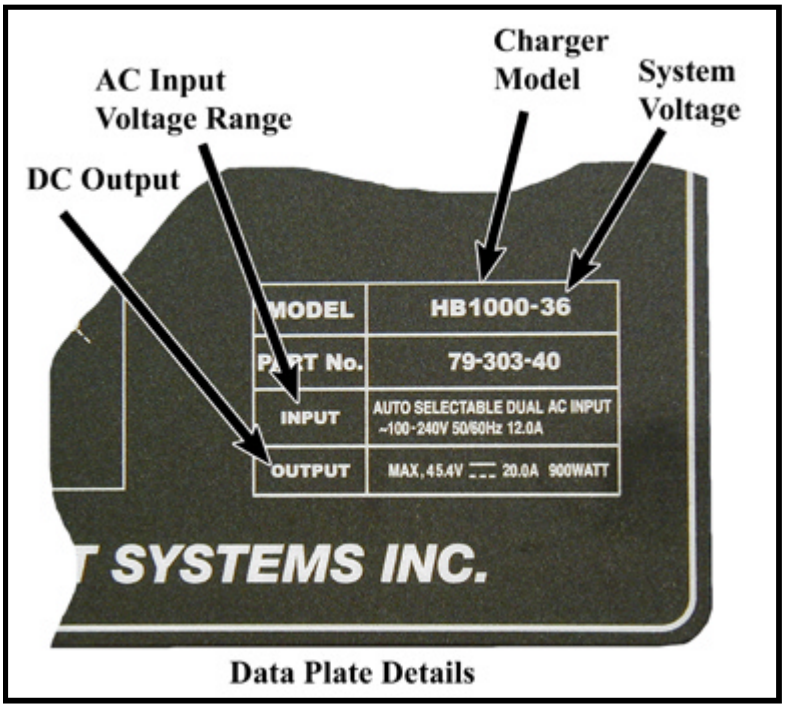
Operating Instructions and Theory of Operation 2
HB/PT and GEL Indicator Lamps 3
Testing the Charging Cycle 3
Test Equipment Required for Troubleshooting 4
Important Notes and Instructions 4
Status LED Error Code Table 5
Troubleshooting 6

⚠CAUTION

Turn the Key switch OFF <u>BEFORE</u> disconnecting the batteries. Disconnecting the batteries with the key switch ON may corrupt the controller programming resulting in a fault code 1 (refer to fault table).

Rev G

OPERATING INSTRUCTIONS AND THEORY OF OPERATION



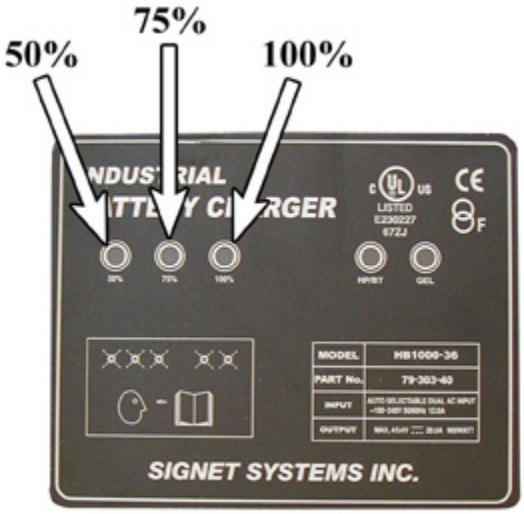
Data Plate Details

The model HB600W® and HB1000W® chargers are designed as semiautomatic chargers. The charger turns itself on when it is plugged into the wall outlet and turns off when the batteries are fully charged.

Both the HB600W® and HB1000W® are two stage chargers. The first stage is a constant current mode. It Maintains a constant current until the battery reaches a terminal voltage and then switches to the second stage, constant voltage. At the second stage the charger decreases the charger current while holding the batteries at the terminal voltage until the charging cycle is complete.

The charger faceplate has three status LED's that monitor the charging status. Refer to the chart and illustration below for the function of these LED's.

If an error occurs during charging, the charger will beep, and display an error code by flashing the status LED's. Refer to the Status LED error code table later in this section.



Typical Charger Data Plate
(your data plate may vary)

Charging Status	Left (50%)	Middle (75%)	Right (100%)
0-50%	**FLASHING**	OFF	OFF
50%-75%	ON	**FLASHING**	OFF
75%-100%	ON	ON	**FLASHING**
Charging Cycle complete	ON	ON	ON
Error, refer to troubleshooting	**FLASHING**	**FLASHING**	**FLASHING**
Charger Time Out	OFF	OFF	**FLASHING**

HB/PT AND GEL INDICATOR LAMPS

NOTE: Your charger may not be equipped with these lamps.

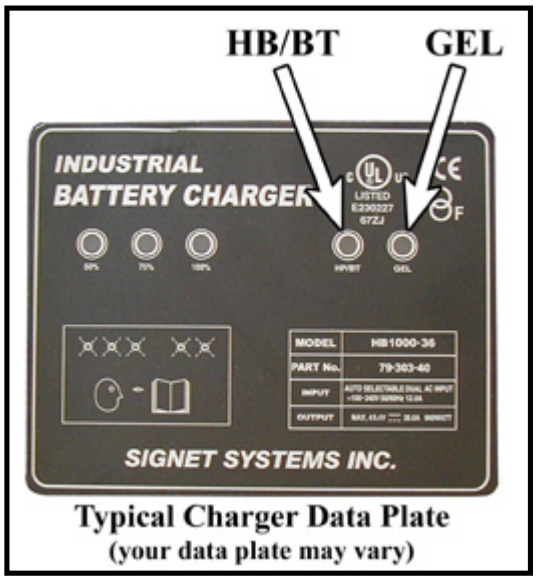
HB/PT Lamp

If the HB/PT lamp is "ON", then the charger has overheated and has entered a proportionally reduced output. The charging cycle will terminate if the temperature continues to rise. If the charging cycle is terminated, the charger will automatically restart once it has cooled.

The charging cycle is limited to 18-hours. If the HB/PT lamp is flashing, then the charging time has exceeded 18-hours (time is limited to 18-hours). If any of the status lamps are flashing, then the charge cycle did not complete.

GEL lamp

This LED will only be "ON" if the charger is configured for GEL batteries. Using a GEL charger with non-GEL batteries may result in an incomplete charge or long charge times.



Typical Charger Data Plate
(your data plate may vary)

⚠CAUTION

GEL batteries must be charged with a charger configured for GEL batteries. Use of any other charger will result in damage to the batteries and premature failure of the batteries.

TESTING THE CHARGING CYCLE

In typical installations, the charger will remain on for up to 12 hours depending on the state of charge of the batteries when the charge cycle was started.

NOTE: Charging time is limited to 18-hours (max). An error occurs if charging time exceeds 18-hours. See table on previous page.

A charger could remain on for longer than 12 hours if:
- The vehicle is equipped with batteries larger than 220 Amp hour capacity.
- The charging cycle is interrupted at any time during the charging cycle.
- Defective batteries causing a fluctuating DC voltage that confuses the charger.
- One or more defective cells in the battery pack.
- A brownout (drop in AC line voltage) during the charging cycle.
- An electrically noisy charging environment.

A charger could turn off in less than 12 hours, but still show symptoms of overcharging if:
- The electrolyte in the batteries is too high (boil over).
- The electrolyte in the batteries is too low (excessive gassing or sulfur smell).

To test the charger to see if it is turning off correctly, monitor the battery voltage and charging current during the charging cycle as indicated below.

Using a digit digital voltmeter and clamp on DC ammeter, monitor the battery voltage and current during the charging cycle. The charging current should remain within 10% of the DC output current (see previous page) until the battery voltage reaches 2.55 volts per cell. When the voltage reaches 2.55 volts per cell, the charging current will drop significantly and slowly taper off (voltage will remain constant). The charger should turn off within 2 to 4 hours after entering the second stage.

TEST EQUIPMENT REQUIRED FOR TROUBLESHOOTING

Digital Multi Meter (DMM), FLUKE 79® model shown at right and in the troubleshooting illustrations.

Clamp on DC ammeter to measure up to 20-Amps.

Important Notes and Instructions

- This troubleshooting guide assumes a familiarity with the use of a digital multimeter including, voltage tests, continuity tests and diode testing. If not familiar with any part of these tests, refer testing to a qualified technician.
- Make sure that the AC electrical socket the charger is plugged into is in good working condition.
- Make sure that the AC voltage at the electrical socket is the same as the AC voltage on the charger nameplate.
- Make sure the batteries are in good condition.
- If the charger exhibits intermittent problems, it must be in the failed mode for troubleshooting.
- Battery volts = Full voltage available at the batteries at the time of the test being performed.
- There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.

⚠CAUTION

This charger is rated for 115 VAC or 230 VAC operation. When switching from one input voltage to the other, wait until all three status LED's are off. Switching voltage when any of the LED's are on will result in damage to the charger.

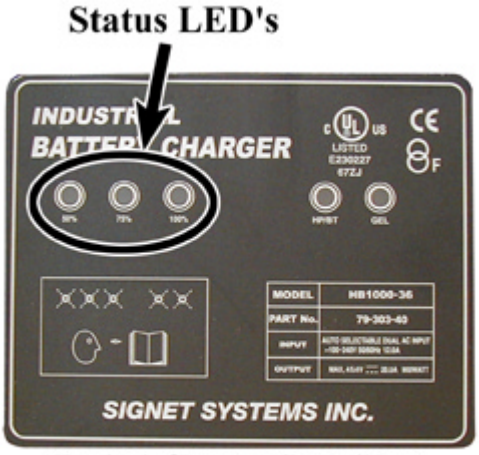
STATUS LED ERROR CODE TABLE

There are three status lights (LED's) on the charger name plate. These LED's normally indicate the current operating state of the charger. If all three LED's are flashing, it indicate an error has occurred in the charging cycle. See the table below for an explanation of the error codes:

Note: If only the 100% LED is flashing and all others are OFF then the charger has exceeded its maximum charging time and shut off before the batteries were fully charged.
This could be a result of:

- Defective battery or batteries
- Excessively discharged batteries
- Oversize batteries

Error Code	Description	Action Required
1	Reverse polarity or open circuit to the batteries	Check wiring for corrosion, loose connections. broken wires and proper connection to the batteries
2	AC line voltate too high or too low	Check the input voltage. It must be within 96-132VAC or 196-266VAC
3	Charger overheated	Wait for charger to cool, the charger will automaticaly restart. Inspect for dirt or debris on the charger cooling fins and clean as required.
4	Input or Output over current	Charger will automaticaly correct for this condition and restart



Typical Charger Data Plate
(your data plate may vary)

TROUBLESHOOTING

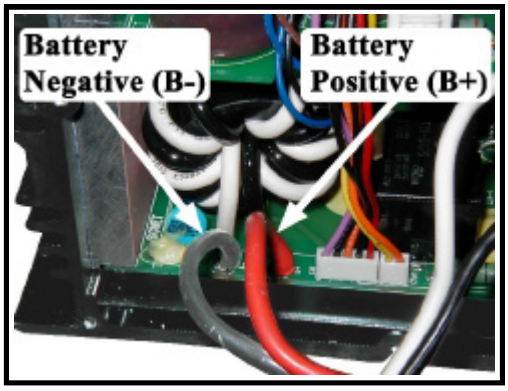
To test charger operation:

Connect a DC volt meter to the main battery positive and negative terminals.
Attach a clamp on DC Ammeter to one of the charger DC output wires.
Plug the charger into an AC outlet.
Wait for charger to start (up to15 seconds), the ammeter should display the DC Amp rating of the charger (plus or minus 10%) indicating that the charger is on (constant current mode).
The ammeter should continue to display the DC Amp rating of the charger until the battery voltage equals 2.55 VPC. When the battery voltage equals 2.55 VPC the charger will switch to the constant voltage mode. At this point the charging current will be reduced and will taper off until the batteries are fully charged.
Perform the following if the charger does not turn on:

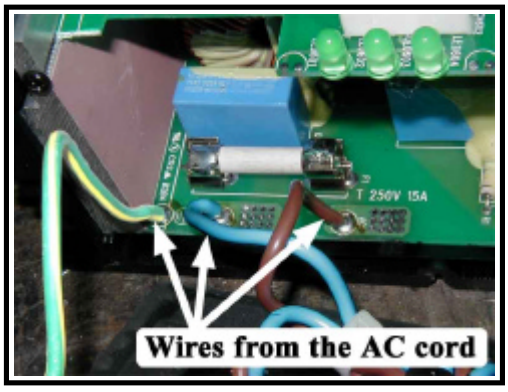
⚠WARNING

1. **Make sure the key-switch is in the "OFF" position, then remove the key.**
2. **Place the forward-reverse switch in the center "OFF" position.**
3. **Set the park brake.**
4. **Place blocks under the front wheels to prevent vehicle movement.**

5. Disconnect the charger from the AC source.
6. Remove the charger end cap where the DC wires enter.
7. Test the voltage across the Battery Positive (red) and Battery Negative (black) wires at the lower left of the charger circuit board. This voltage should be equal to the battery voltage. If the voltage is less than the battery voltage, then the wires to the batteries have been damaged. **Stop here and repair the problem.**
8. Reinstall the charger end cap where the DC wires enter.



9. Remove the charger end cap where the AC wires enter.
10. Test the continuity of all three AC wires from the circuit board to the AC plug. If you find an open circuit in any one of the three wires then the AC cord or plug has been damaged. **Stop here and repair the problem.**
11. Install the charger end cap where the AC wires enter.



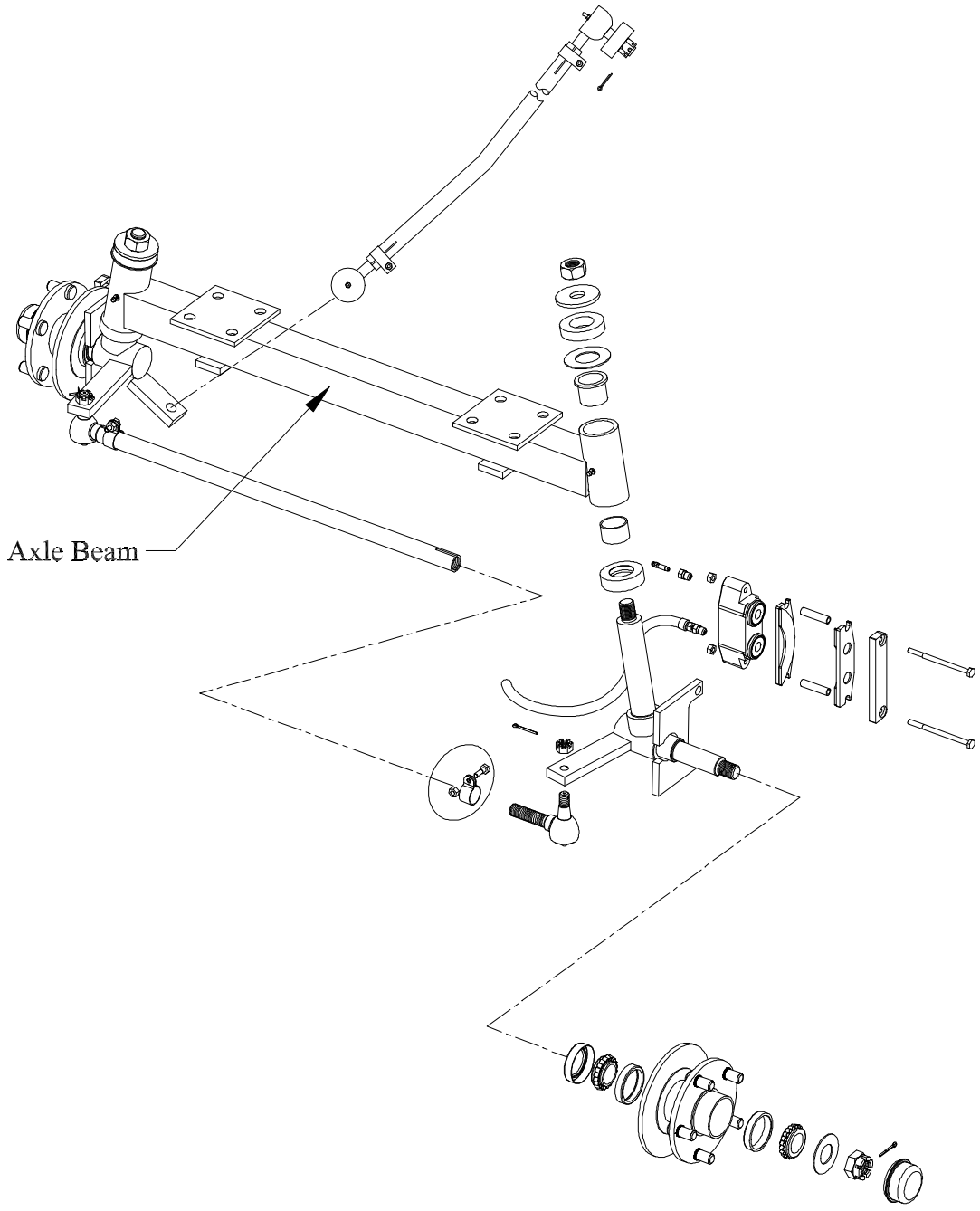
If both the AC and DC tests are good then the charger has failed. There are no internally serviceable components in the charger. If the charger has failed then it must be replaced.

Illustrated Parts

TABLE OF CONTENTS

Front Axle 2
Steering Knuckle 4
Steering Linkage 6
Steering Column 8
Front Suspension 10
Steering Gear 10
Rear Suspension 12
Transmission Gear Case 14
Rear Axle 16
Transmission Differential Case 16
Rear Brakes 18
Front Brakes 18
Brake Lines 20
Master Cylinder 20
Motor 22
Motor Mount 24
Wheels and Tires 26
Instrument Panel (dash) 28
Wire Harnesses 28
Speed Control Panel 30
Resetting the Maintenance Meter Function 31
Miscellaneous Electrical 32
Lighting 34
Lestronic® Charger (page 1) 36
Lestronic® Charger (page 2) 38
Signet® Charger 40
Portable Charger Wiring 40
Batteries 42
Seat Cushions and Deck 44
Mirrors 46
Miscellaneous Frame Components 46
Decals 48
Cab Options 50
Door Options, Steel Cab 52
Door Options, Fiberglass Cab 54
Hydraulic Dump Body Option 56
Rear Cargo Box 58
Top Covers 58
Hitches 60
Ladder Rack Option B2-004-66 and B2-006-78“ 61

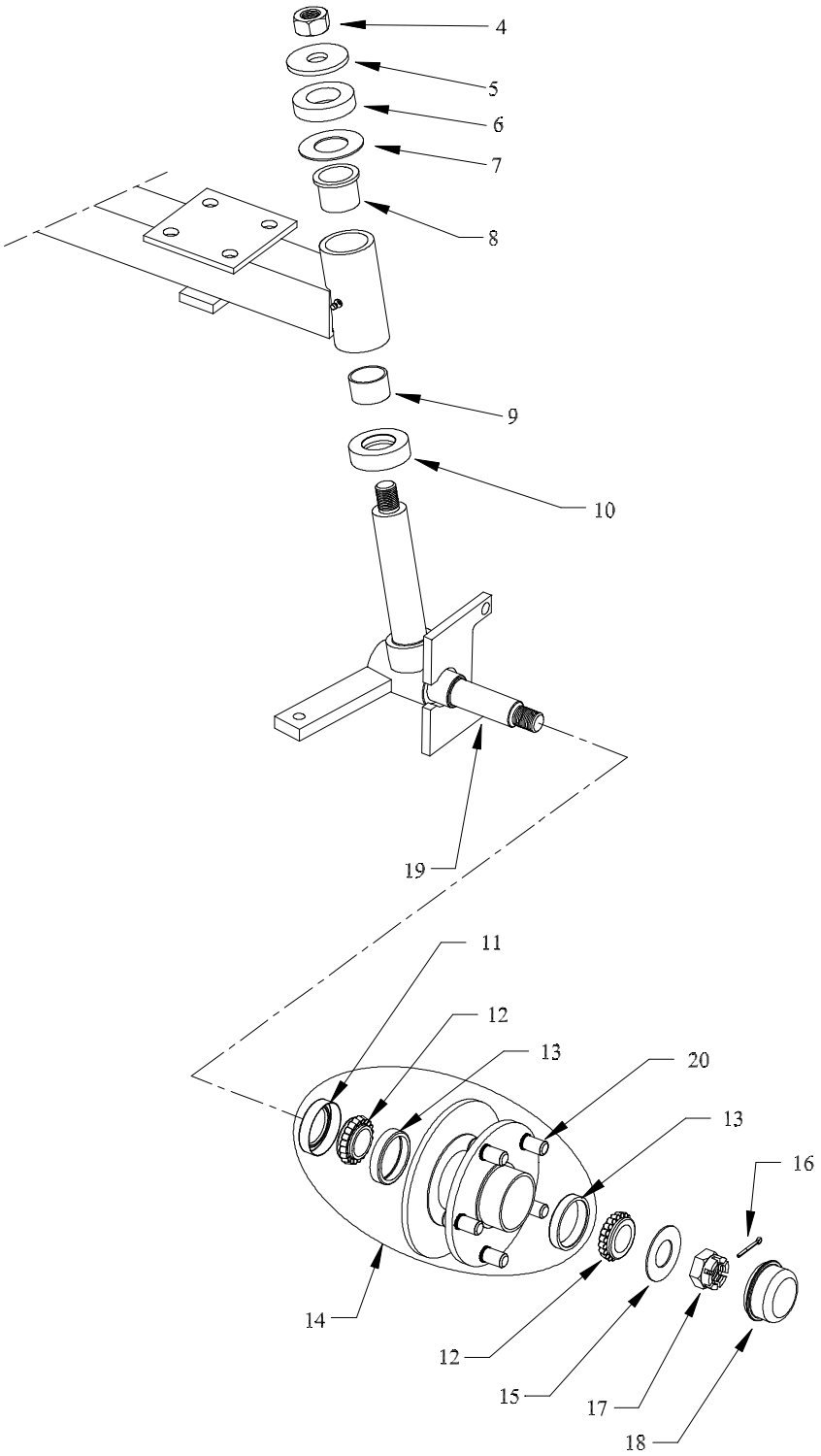
Front Axle



Front Axle			
ITEM #	PART #	DESCRIPTION	QTY
-	15-049-71	Axle Beam, B 2-48, BT 2-48, B 2-54	1
	15-050-76	Complete axle assembly	1

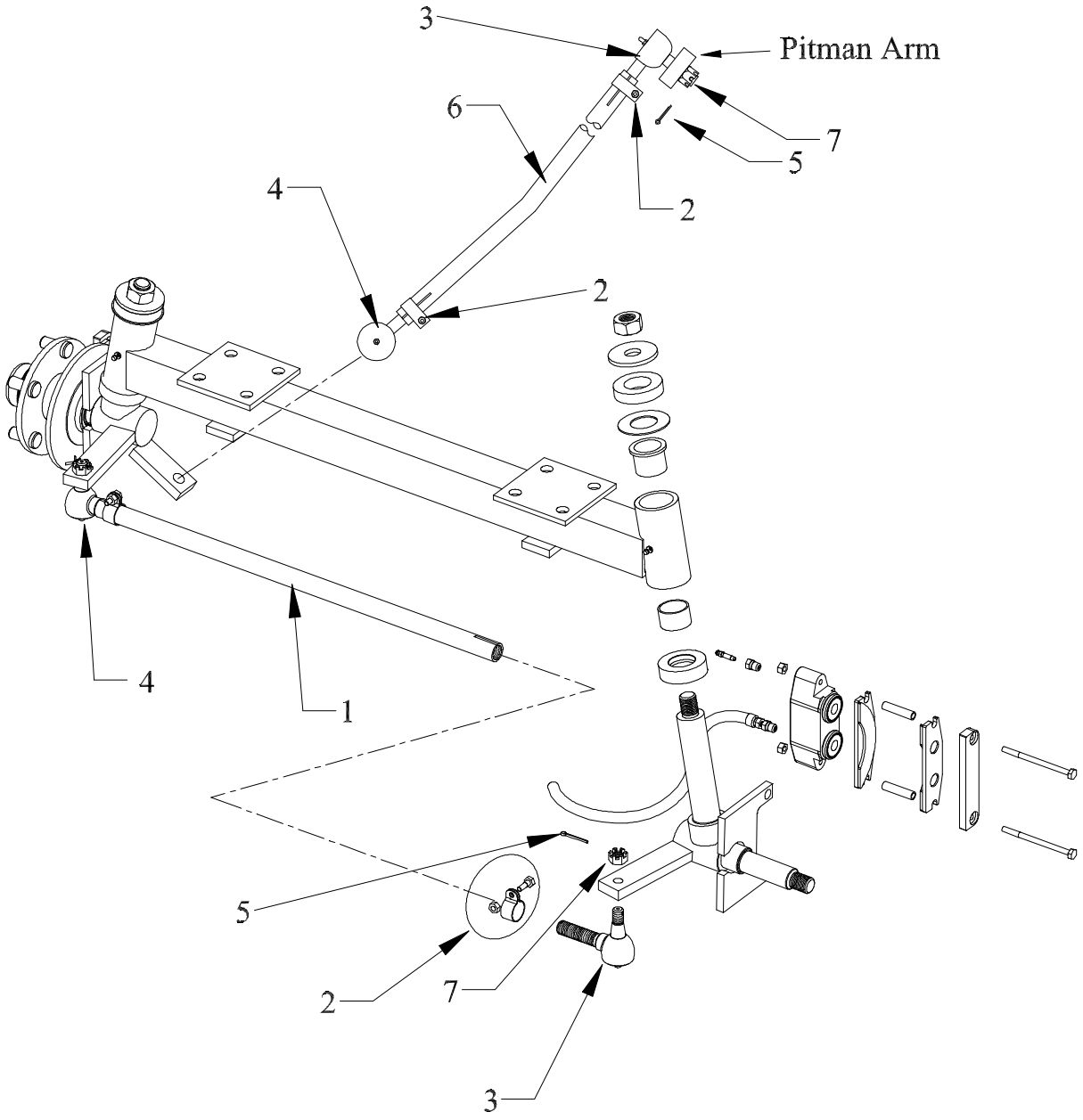
See following pages for component breakdowns

Steering Knuckle



Steering Knuckle			
ITEM #	PART #	DESCRIPTION	QTY
–			
–			
–			
4	88-239-86	3/4-NF Hex Slotted Nut	2
5	88-228-60	3/4 Cut Flat Washer	2
6	98-603-07	Rubber Bushing	2
7	01-220-99	Washer	2
8	32-240-44	Bushing	2
9	32-240-43	Bushing	2
10	80-309-12	Thrust Bearing	2
11	45-338-00	Grease Seal	2
12	80-017-00	Tapered Bearing	4
13	80-103-00	Tapered Bearing Race	4
14	12-158-10	Wheel Hub W/Rotor (incl 1-#12, 1-#11, 1-#13)	2
15	88-228-61	3/4 SAE Flat Washer	2
16	88-527-14	1/8 x 1-1/2 Cotter Pin	2
17	88-239-85	3/4-NF Hex Slotted Nut	2
18	92-104-01	Bearing cap	2
19	21-020-20	Right Steering knuckle	1
	21-020-21	Left Steering Knuckle	1
20	96-329-00	Wheel stud	10

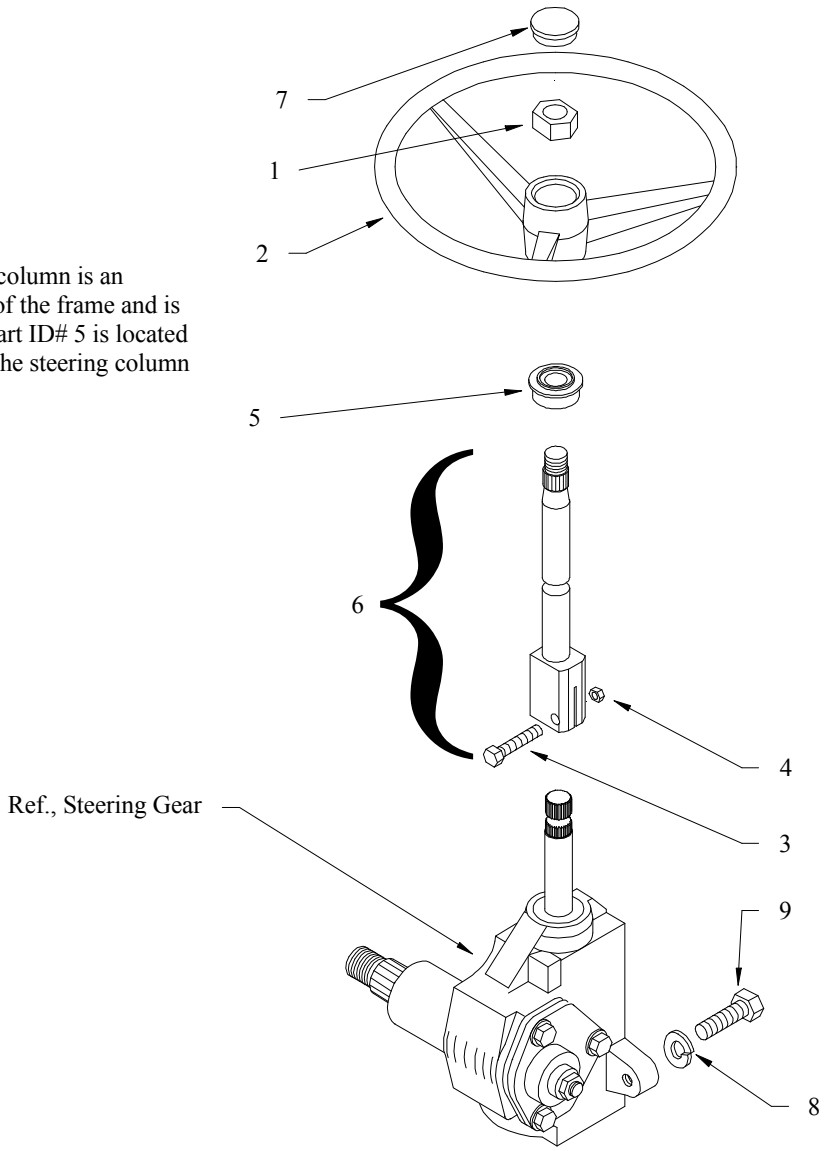
Steering Linkage



Steering Linkage			
ITEM #	PART #	DESCRIPTION	QTY
1	18-041-05	Tie rod, B 2-48, B 2-54, BT 2-48	1
2	86-510-00	Ball joing clamp	4
3	86-501-98	Ball joing (left)	2
4	86-501-99	Ball joint (right)	2
5	88-527-11	1/8 x 1 Cotter pin	4
6	18-057-11	Drag link	1
7	88-159-85	1/2NF Castle nut	4
	18-104-00	Pitman Arm	1

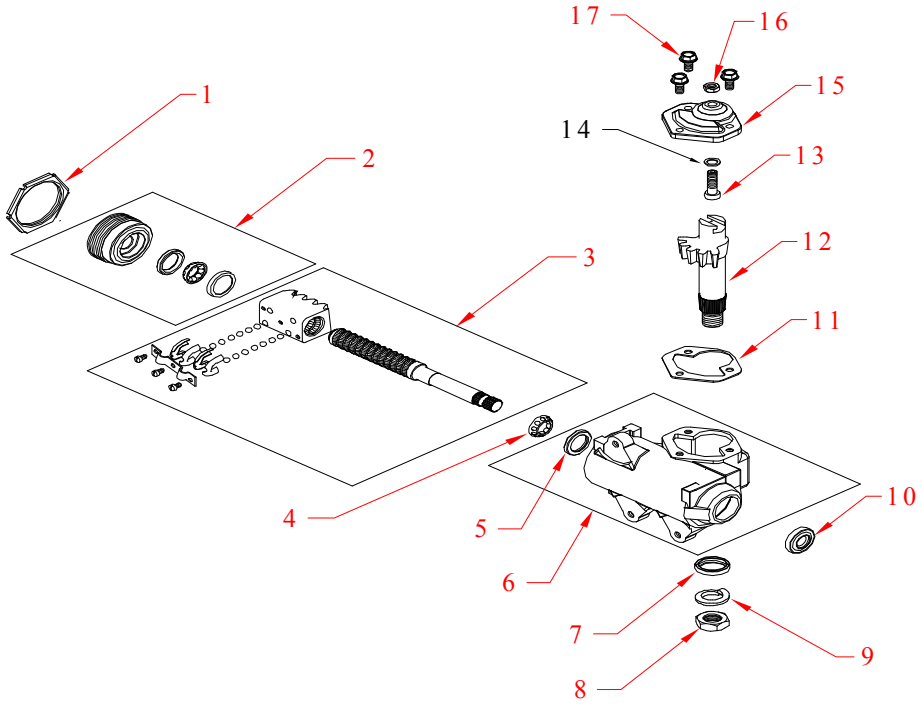
Steering Column

The steering column is an integral part of the frame and is not shown. Part ID# 5 is located in the top of the steering column tube.

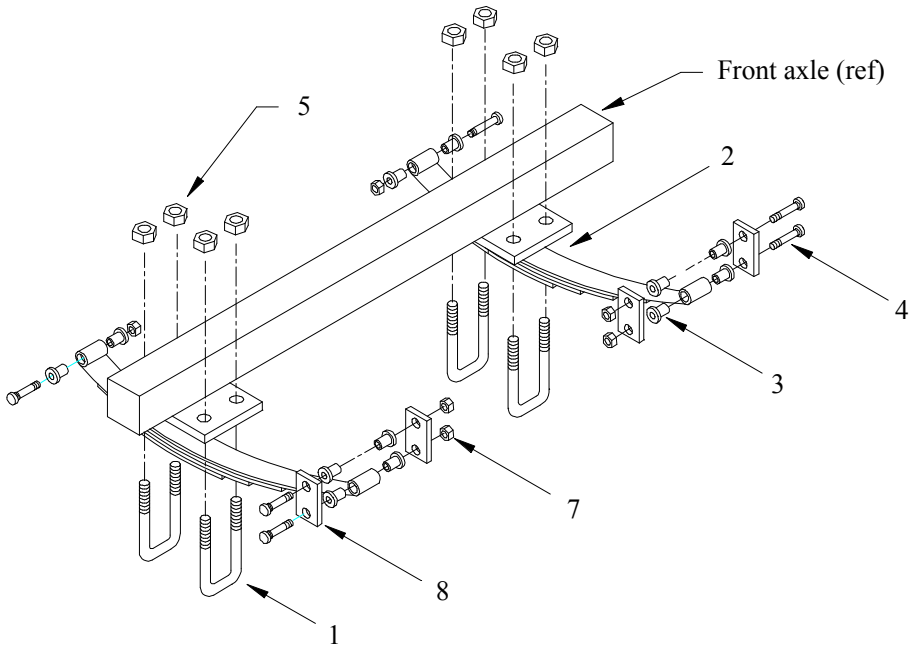


Steering Column			
ITEM #	PART #	DESCRIPTION	QTY
1	88-199-82	5/8NF Hex nut	1
2	19-011-20	Steering wheel	1
3	88-081-14	5/16NF x 1-1/2 Hex bolt, grade 8	1
4	88-089-84	5/16NF Hex lock nut, grade C	1
5	32-248-10	Upper bushing	1
6	20-031-65	Steering shaft assembly (incl. 3 and 4)	1
7	19-011-25	Steering wheel cap	1
8	88-128-62	7/16 Split lock washer	3
9	88-120-15	7/16 x 1 Hex bolt	3
Not Shown	88-279-82	7/8NF Thin pattern hex nut, Pitman shaft	1
	88-268-62	7/8 Split lock washer, pitman shaft	1

Steering Gear



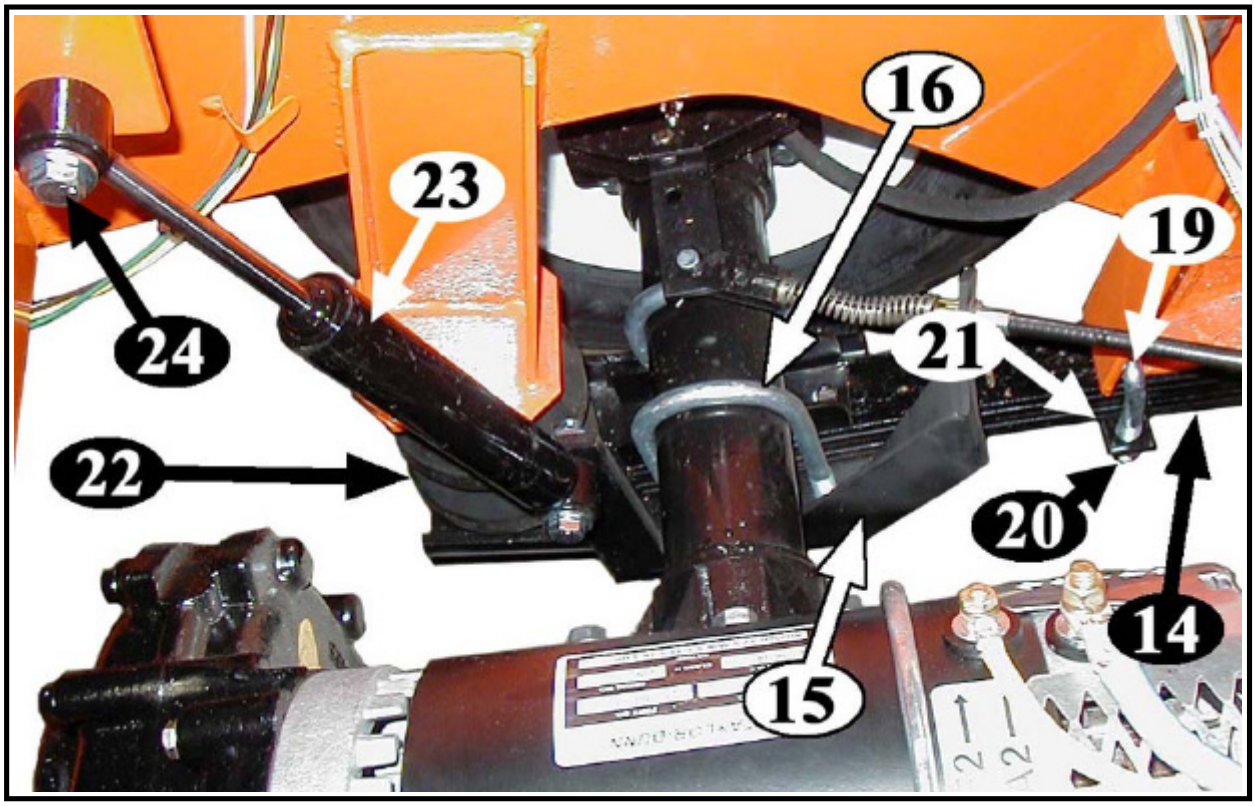
Front Suspension

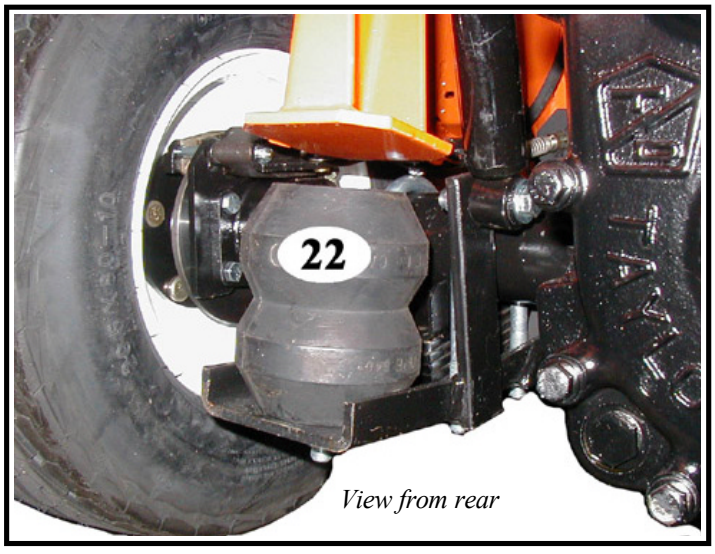


Steering Gear 18-308-21			
ITEM #	PART #	DESCRIPTION	QTY
1	18-308-70	Locknut	1
2	18-308-71	Adjuster assembly	1
3	18-308-72	Worm assenbly	1
4	18-308-23	Upper worm bearing	1
5	18-308-22	Upper worm bearing race	1
6	18-308-77	Housing	1
7	18-308-78	Seal, pitman shaft	1
8	18-308-80	Nut, pitman shaft	1
9	18-308-81	Lock washer	1
10	18-308-79	Seal, input shaft	1
11	18-308-82	Gasket	1
12	18-308-76	Pitman shaft	1
13	18-308-75	Gear lash adjuster	1
14	18-308-85	Shim kit	1
15	18-308-84	Side cover	1
16	18-308-86	Jam nut	1
17	18-308-83	Bolt, side cover	3

Front Suspension			
ITEM #	PART #	DESCRIPTION	QTY
1	96-121-00	U-bolt	4
2	85-498-00	Leaf spring, B 2-48	2
	85-486-00	Leaf spring, B 2-54	2
3	32-214-50	Bushing	12
4	96-240-00	1/2NC x 4 Hex bolt	6
5	88-149-81	1/2NC Lock nut	8
6	-	-	-
7	88-149-81	1/2NC Lock nut	6
8	16-872-00	Spring hanger	4

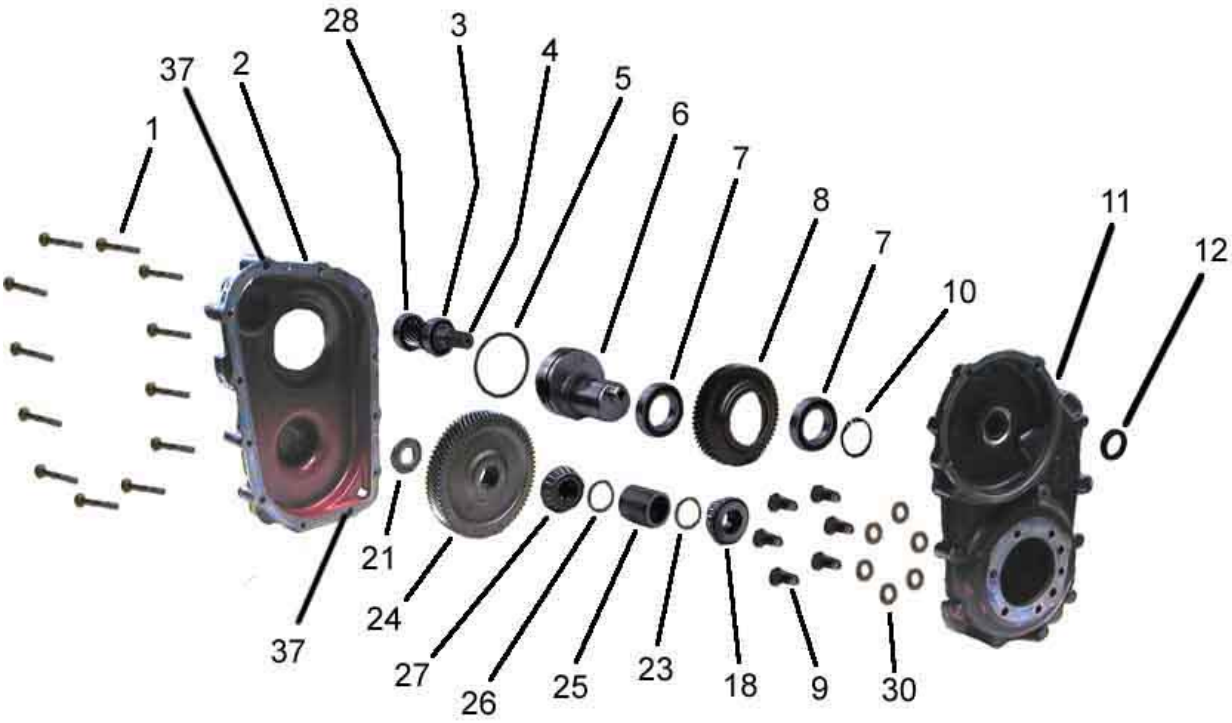
Rear Suspension





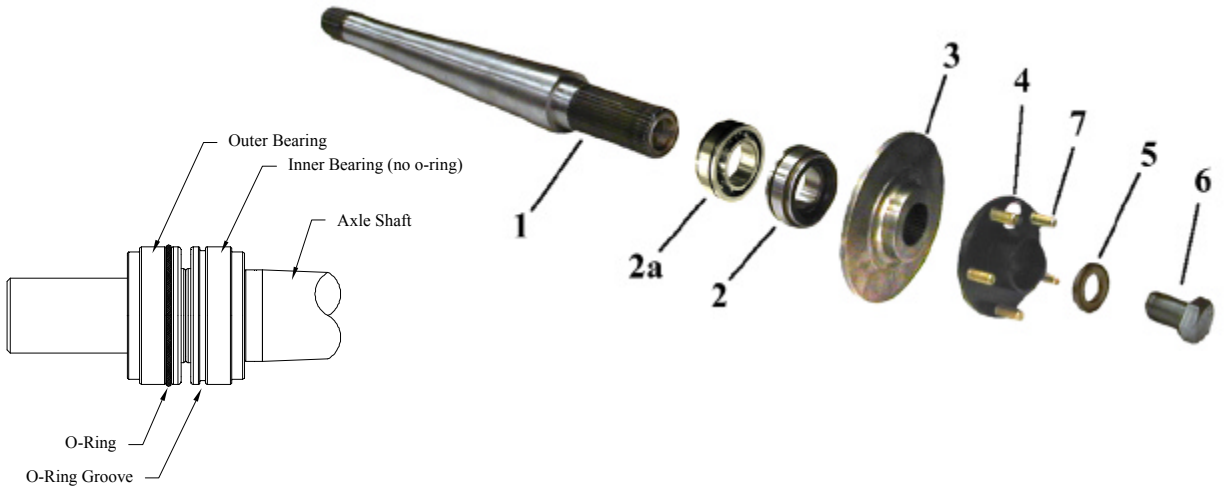
Rear Suspension			
ITEM #	PART #	DESCRIPTION	QTY
Not shown	96-240-00	1/2NC x 4 Spring bolt (front of the leaf spring)	2
	32-214-50	Spring bushing (front of the leaf spring)	4
14	85-510-17	Leaf spring	2
15	16-861-46	Spring mounting plate (left)	1
	16-861-47	Spring mounting plate (right)	1
16	96-114-00	U-bolt	4
	88-159-84	1/2NC Nylon lock nut	8
18	-	-	-
19	96-103-00	U-bolt	2
20	88-149-81	1/2NC Lock nut	4
21	50-460-00	Strap	2
22	98-002-00	Rubber overload spring (optional)	2
23	86-602-00	Shock	2
24	88-120-17	7/16NC x 2-1/4 Hex bolt	2
	88-129-81	7/16NC Lock nut	2
	88-128-60	7/16 Flat washer	2

Transmission Gear Case



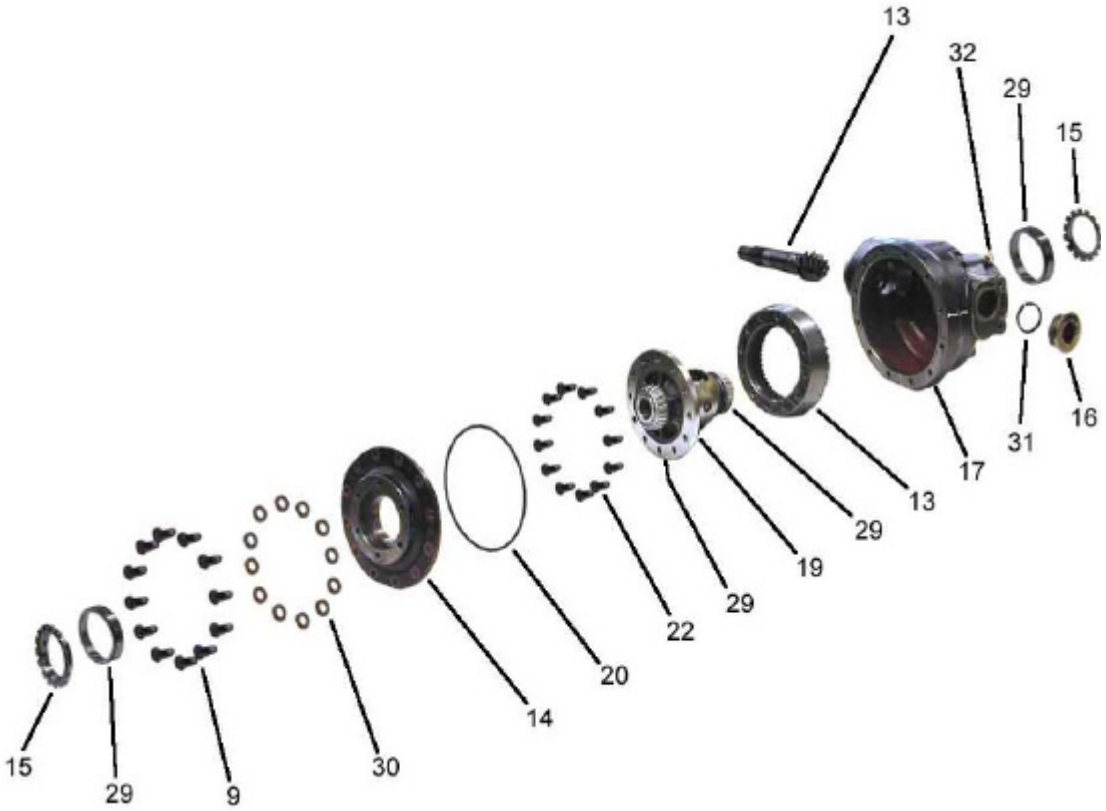
Transmission Gear Case			
ITEM #	PART #	DESCRIPTION	QTY
1	GT-71682	M8 x 60 bolt	12
2	GT-3287563	Gear case cover	1
3	GT-71259	Bearing	1
4	GT-3287513	Input shaft, 30:1	0 or 1
	GT-3287523	Input shaft, 24:1	0 or 1
	GT-3287533	Input shaft, 18:1	0 or 1
5	GT-71982	O-ring	1
6	GT-3287503	Eccentric shaft	1
7	GT-72005	Bearing	2
8	GT-3287493	Idler gear	1
9	GT-70302	M10 x 30 Bolt	6
10	GT-71715	Snap ring	1
11	GT-3287553	Gear case housing	1
12	GT-72019	Seal	1
18	GT-71979	Bearing	1
21	GT-3273633	Pinion nut	1
23	See Note 1, previous page	Spacer	1
24	GT-3287453	Output gear, 30:1	0 or 1
	GT-3287463	Output gear, 24:1	0 or 1
	GT-3287473	Output gear, 18:1	0 or 1
25	GT-328	Spacer, 46.100mm	1
	GT-328	Spacer, 46.100mm	0 or 1
	GT-328	Spacer, 46.125mm	0 or 1
	GT-328	Spacer, 46.150mm	0 or 1
	GT-328	Spacer, 46.175mm	0 or 1
26	GT-3287903	Shim, 0.100mm	0 or 1
	GT-3287883	Shim, 0.400mm	0 or 1
	GT-3287893	Shim, 0.500mm	0 or 1
	GT-3287853	Shim, 0.600mm	0 or 1
	GT-3287863	Shim, 0.700mm	0 or 1
	GT-3287873	Shim, 0.800mm	0 or 1
27	GT-71068	Bearing	1
28	GT-72022	Bearing	1
30	GT-70299	10mm Washer	6
37	GT-3252633	Dowel pin	2

Rear Axle



Inner bearing on optional double bearing axle does not have an oil seal or o-ring. Orientation of bearing should have o-ring groove adjacent to o-ring on outer bearing.

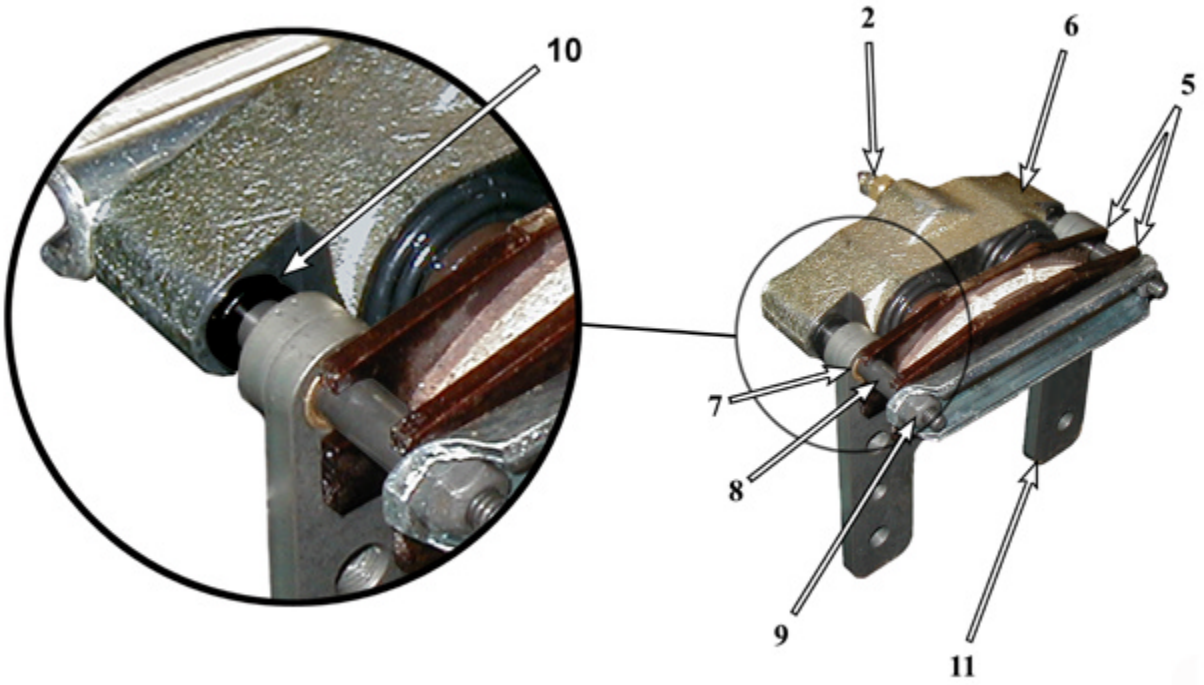
Transmission Differential Case



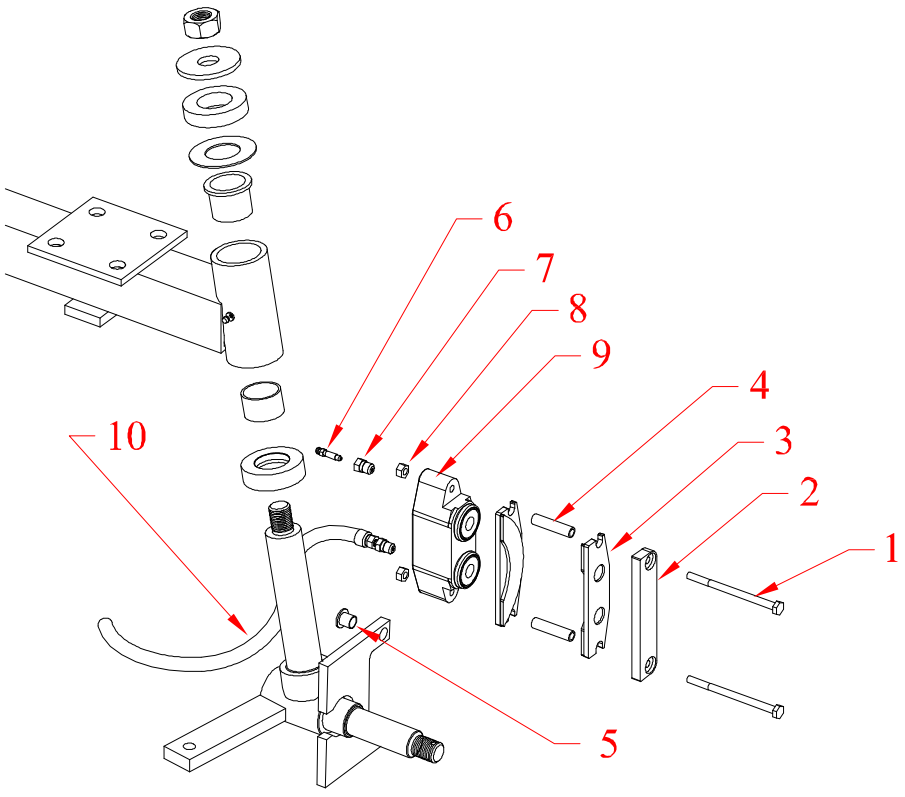
Rear Axle			
ITEM #	PART #	DESCRIPTION	QTY
1	41-154-20	Axle shaft (single bearing)	2
	41-154-25*	*Axle shaft (double bearing)	2
2	80-505-20	Bearing	2
2a	80-505-30*	*Bearing (for double bearing axle)	2*
3	41-490-11	Disc brake rotor	2
4	41-172-21	Hub	2
5	88-268-63	Flat washer	2
6	88-268-30	7/8-14 x 1.5 Bolt, grade 5	2
7	96-329-10	Wheel stud	10
Not shown	92-104-10	Hub cover	2
	41-290-40	Axle housing, left (single bearing)	1
	41-290-43	Axle housing, right (single bearing)	1
	41-290-78*	*Axle housing, left (double bearing)	1
	41-290-79*	*Axle housing, right (double bearing)	1
	89-113-30	M12 x 1.75 x 30mm Hex bolt (axle housing to center section)	6
	89-113-60	M12 Split lock washer (axle housing to center section)	6
* - B 2-54 optional double bearing axle			

Transmission Differential Case			
ITEM #	PART #	DESCRIPTION	QTY
9	GT-70302	M10 x 30 Bolt	12
13	GT-3287183	Ring and pinion gear set	1
14	GT-3297193	Differential case cover	1
15	GT-3287133	Adjusting ring	2
16	GT-70417	Fill/Level plug	1
17	GT-3287113	Differential housing	1
19	GT-3287143	Differential case	1
20	GT-72013	O-ring	1
22	GT-71896	M10 x 25 Bolt	12
29	GT-71978	Bearing and race	2
30	GT-70299	10mm Washer	12
31	GT-71881	Seal	1
32	GT-70052	Vent	1

Rear Brakes



Front Brakes

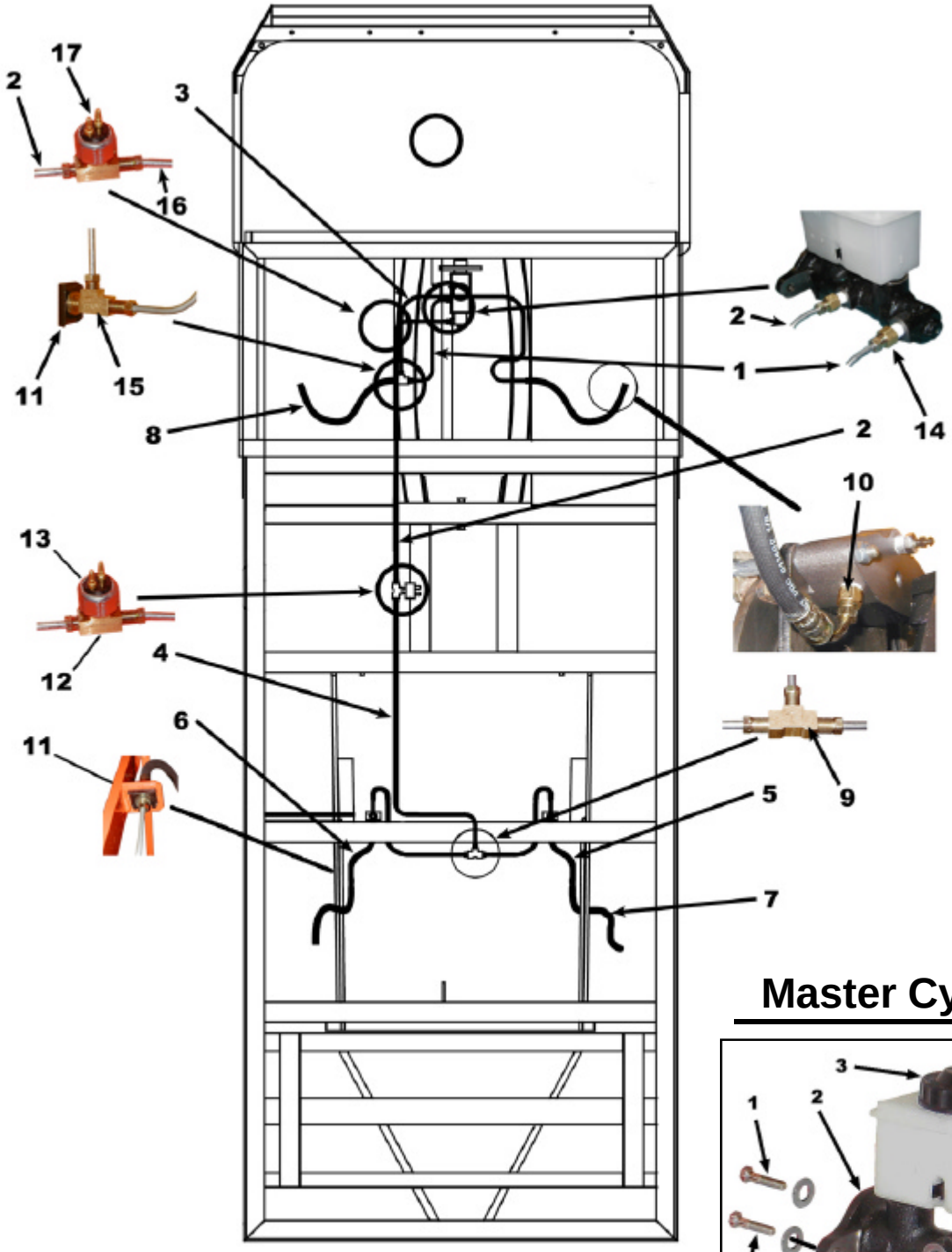


Rear Brakes			
ITEM #	PART #	DESCRIPTION	QTY
1	-	-	-
2	99-588-00	Bleeder valve	2
	99-588-01	Bleeder adaptor	2
3	-	-	-
4	-	-	-
5	41-348-70	Brake pad	4
6	41-351-30	Brake body assembly (includes 3, 4, 5, 8, 9, 10)	2
7	32-240-41	Bushing	4
8	41-348-57	Spacer	4
9	88-067-21	Bolt	4
	88-069-82	Nut	4
10	97-126-05	Flat Washer	4
11	41-350-28	Mounting bracket	2
Not Shown	96-327-10	3/8X3/4,NF,2A THD,GRD5,LOC (brake bracket to drive)	8
	41-886-00	PLUG, 1/8 PIPE, HEX SOCKET	2
* - Not available seperatly, order complete caliper assembly			

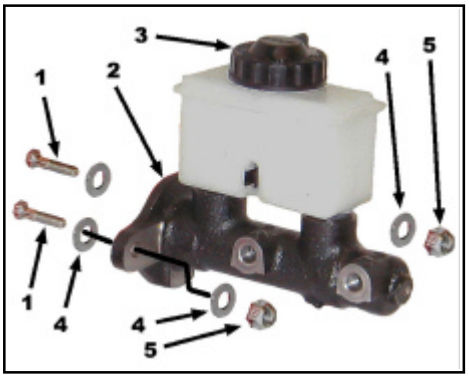
Front Brake			
ITEM #	PART #	DESCRIPTION	QTY
1	88-067-21	Bolt, 1/4 X 3-3/4" NC, Hex Head, Gr. 8	4
2	41-350-51	Plate, Secondary, Hydraulic Disc	2
3	41-348-70	Pad, Disc Brake	4
4	41-348-52	Spacer, Disc Brake	4
5	32-240-41	Bearing Teflon® Coated	4
6	99-588-00	Bleeder screw	2
7	99-588-01	Bleeder screw adapter	2
8	88-069-82	Locknut, 1/4" NC, Gr. 8 Do Not Reuse	4
9	41-351-30	Hydraulic Brake Body Front Assembly	2
10	See Brake Lines	Brake hose	
Not shown	See Steering Knuckle	Front hub and rotor	
	88-109-81	41-886-00	2

NOTE: Brake Body (#9) has no internally serviceable parts.

Brake Lines



Master Cylinder



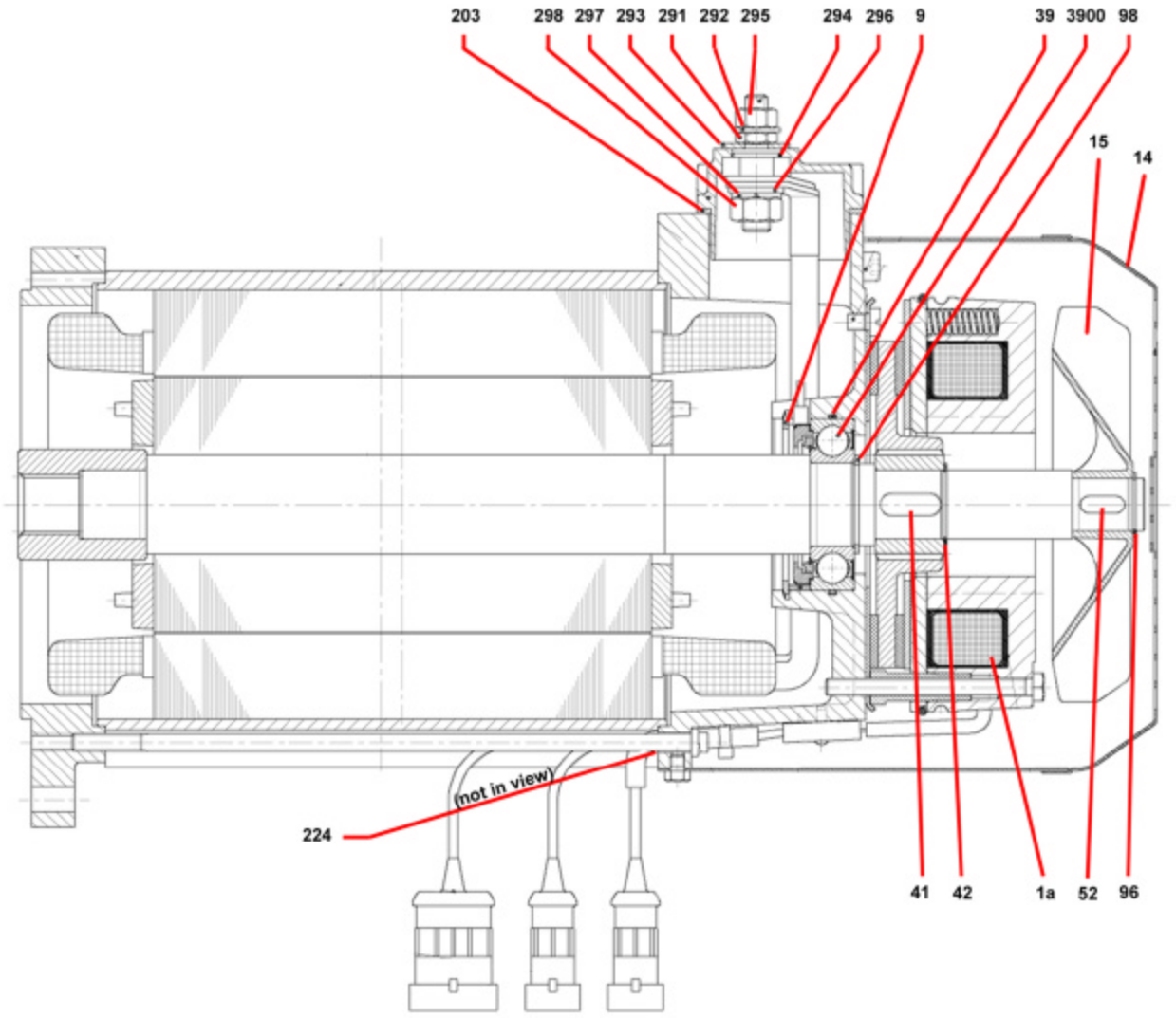
Brake Lines

ITEM#	PART #	DESCRIPTION	QTY
1	99-609-61	Brake Line, front brakes	1
2	99-603-73	Brake Line, regen switch to brake switch	1
3	99-606-51	Brake Line, Front Right	1
4	99-603-72	Brake Line, brake switch to rear brakes	1
5	99-603-70	Brake Line, Rear Right	1
6	99-603-71	Brake Line, Rear Left	1
7	99-580-20	Brake Hose, Rear	2
8	99-580-10	Brake Hose, Front	2
9	99-564-00	T-Fitting	1
10	99-575-10	Adaptor, 3/16T X 1/8P	2
11	99-576-00	Hose Clip	4
12a	99-591-00	Brake light switch / regen switch adaptor	2
13	71-110-00	Brake Light Switch	1
14	99-575-32	Adaptor, 3/16T x M10-1.0	2
15	99-559-00	T-Fitting, Single Male Flare to 2-Female Flare, 3/16 Tube	1
16	99-603-74	Brake line, MS to regen switch	1
		Regen switch	1

Master Cylinder

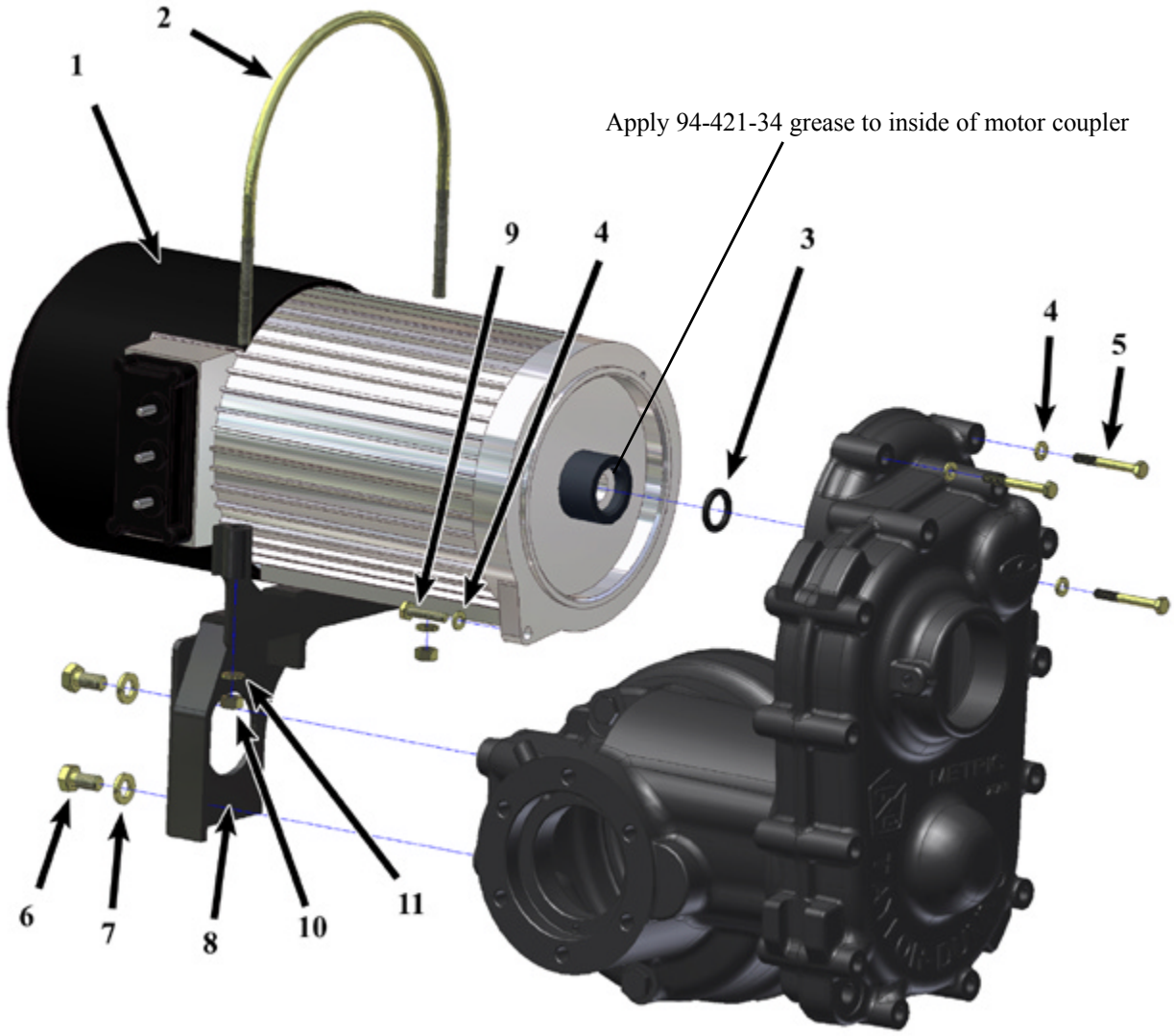
ITEM #	*PART #*	*DESCRIPTION*	*QTY*
1	88-080-14	Bolt, 5/16" X 1-1/2" NC, Hex Head	2
2	99-511-20	Master Cylinder (includes item #3)	1
3	99-511-52	Cap Seal, Master Cylinder	1
	99-511-53	Cap, Master Cylinder	1
4	88-088-61	Washer, 5/16"	4
5	88-089-81	Locknut, 5/16"	2
Not Shown	99-511-51	Rubber Boot, Master Cylinder	1
	50-009-05	Master cylinder push rod	1
	17-104-00	Collar for push rod	1
	96-762-00	Clevis for push rod	1
	85-250-00	Brake pedal return spring	1

Motor


203
298
297
293
291
292
295
294
296
9
39
3900
98
15
14
(not in view)
224
41
42
1a
52
96

70-059-41 Motor Spec # ZFB40SO/4 DF100L-4			
ITEM #	PART #	DESCRIPTION	QTY
1a	41-354-05	Brake	1
9	70-400-14	Snap ring	1
14	70-400-12	Fan Shroud	1
15	70-400-11	Fan	1
39	70-400-15	O-ring	1
41	70-400-16	Key	1
42	70-400-17	Snap ring	1
52	70-400-21	Key	1
96	70-400-18	Snap ring	1
98	70-400-19	Snap ring	1
203	70-400-13	Seal	1
224	70-400-09	Rubber Grommet	2
206	70-260-00	Terminal stud	3
291		Hex nut	3
292		Washer	3
293		Washer	3
294		O-ring	3
295		Hex nut	3
296		Washer	3
297		Lock washer	3
298		hex nut	3
3900	80-216-05	Sensor bearing	1
Not Shown	45-308-30	Rubber seal around brake	1

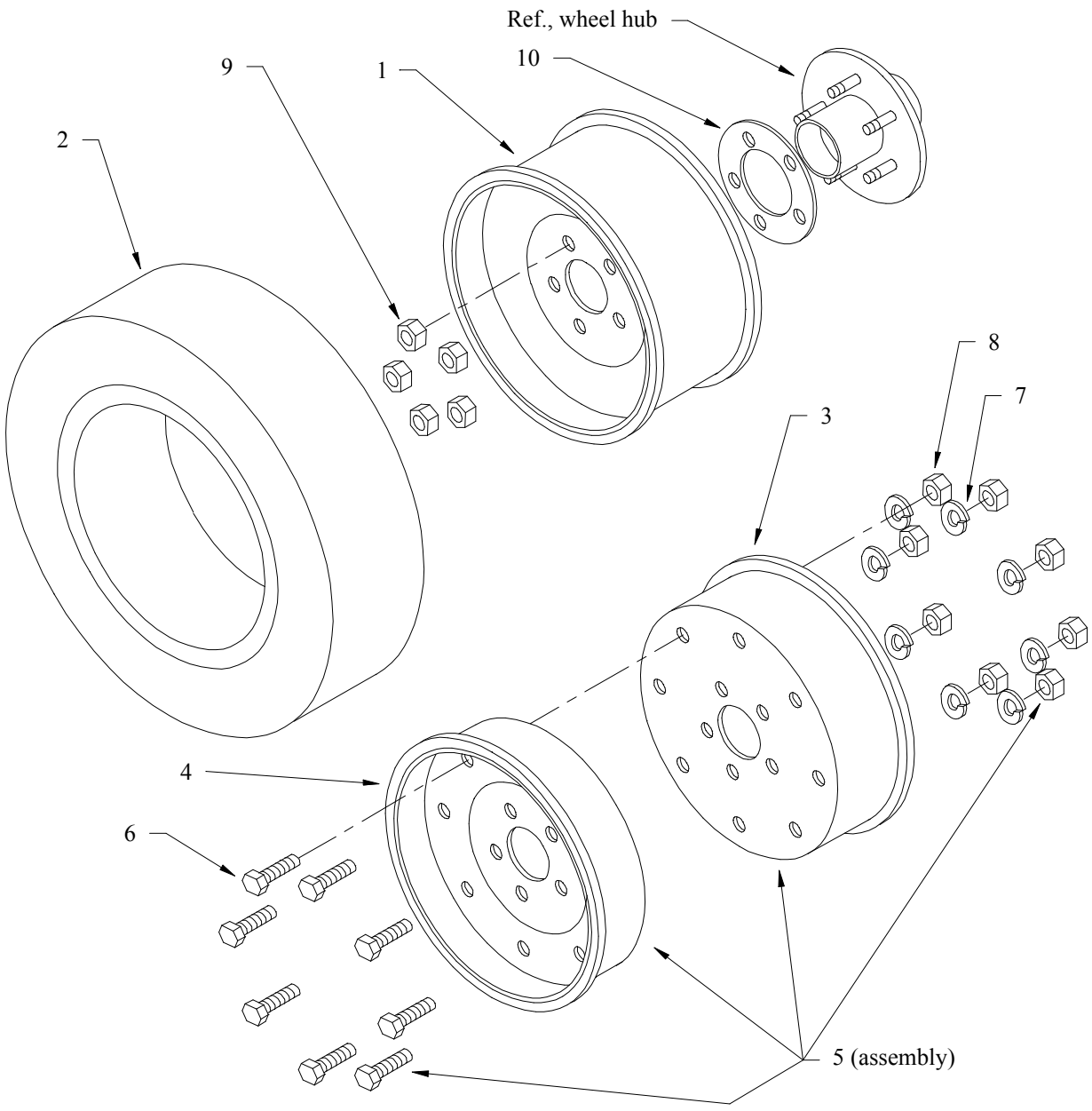
Motor Mount


Apply 94-421-34 grease to inside of motor coupler
1
2
3
4
4
5
6
7
8
9
10
11

MOTOR MOUNT			
ITEM #	*PART #*	*DESCRIPTION*	*QTY*
1	See Motor	Motor	1
2	96-114-12	U-bolt	1
3	80-714-05	O-ring	1
4	88-068-62	1/4 Split lock wahser	4
5	89-060-11	6mm x 1.0 x 50 Hex bolt	3
6	89-111-27	10mm x 1.5 x 20 Hex bolt	2
7	88-128-62	7/16 Split lock washer	2
8	70-456-03	Mounting bracket	1
9	88-067-17	1/4NC x 1-1/4 Hex bolt	1
10	88-099-80	5/16NF hex nut	2
11	88-088-62	5/16 Split lock washer	2

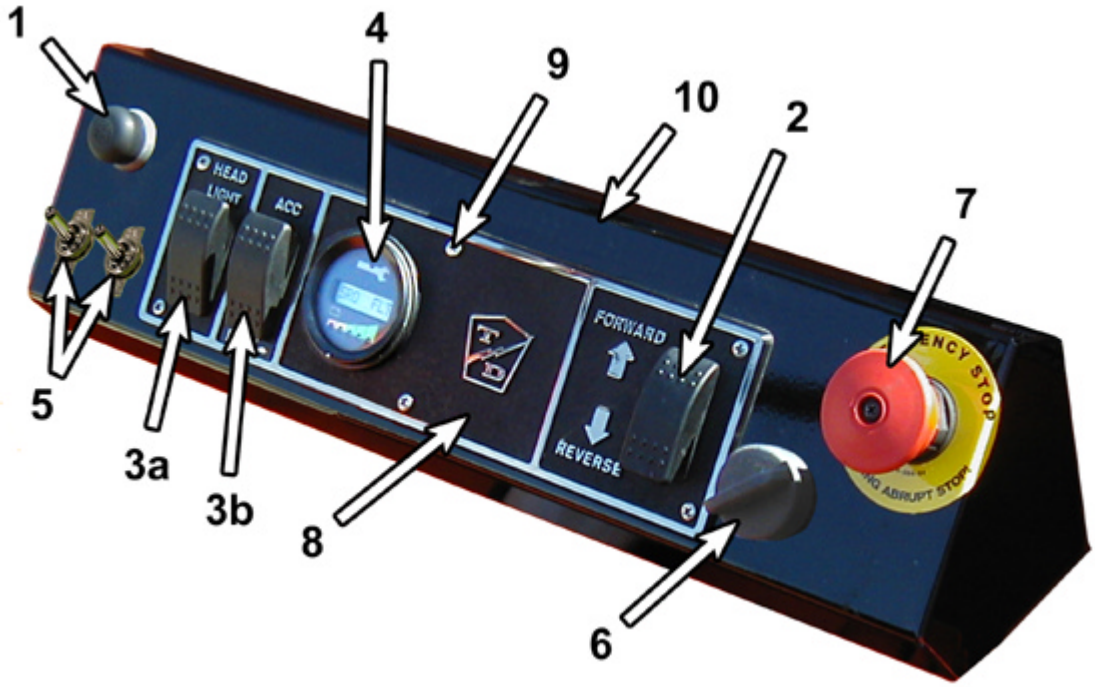
Apply 94-421-34 grease to inside of motor coupler

Wheels and Tires



Wheels and Tires		
ITEM #	PART #	DESCRIPTION
	94-423-20	FLAT OUT,TIRE SEAL,PT BOTL
1	Wheels	
	12-012-00	5 x 8" Tubeless
	12-020-00	8.5 x 8 Tubeless
	12-050-00	12-1/8 Diameter Cast Iron
2	Tires	
	10-083-00	5.70 x 8 LR C
	10-092-00	8.50 x 8 LR C
	10-260-00	18 X 5 X 12 1/8 Solid rubber
	Split Rim Wheels	
3	12-041-12	Inner Wheel (2.5 bead)
4	12-041-13	Outer Wheel (2.5 bead)
5	12-041-00	Wheel Assembly, 2.5 bead width (includes #3, #4, #6, #7, #8)
3a	12-042-12	Inner Wheel (12-bolt)
4a	12-042-13	Outer Wheel (12-bolt)
5a	12-042-00	Wheel Assembly, 3.75 bead width (includes #3a, #4a, #6, #7, #8
6	88-110-09	3/8 x 3/4-NF Hex Bolt, grade 5
7	88-109-62	3/8 Split Lock Washer
8	88-119-80	3/8-NF Hex Nut
9	97-236-00	Wheel Nut
Not Shown	13-989-00	Valve stem, tubless tire only
Not Shown	11-041-00	8.50 x 8 Tube
Not Shown	11-040-00	5.70 x 8 Tube
	Tire and Wheel Assemblies	
	13-955-10	18 x 5 x 12-1/8 Solid rubber
	13-742-13	5.70 x 8 LR C Pneumatic
	13-742-35	5.00 x 8 MONOMATIC ,SOLID
	13-742-12	5.70 x 8 Split Rim, LR C
	13-746-10	8.50 x 8 Pneumatic
	13-746-13	18.5 x 8.50 x 8, LR C
	13-742-50	5 x 8 Softshoe, Non-marking

Instrument Panel (dash)

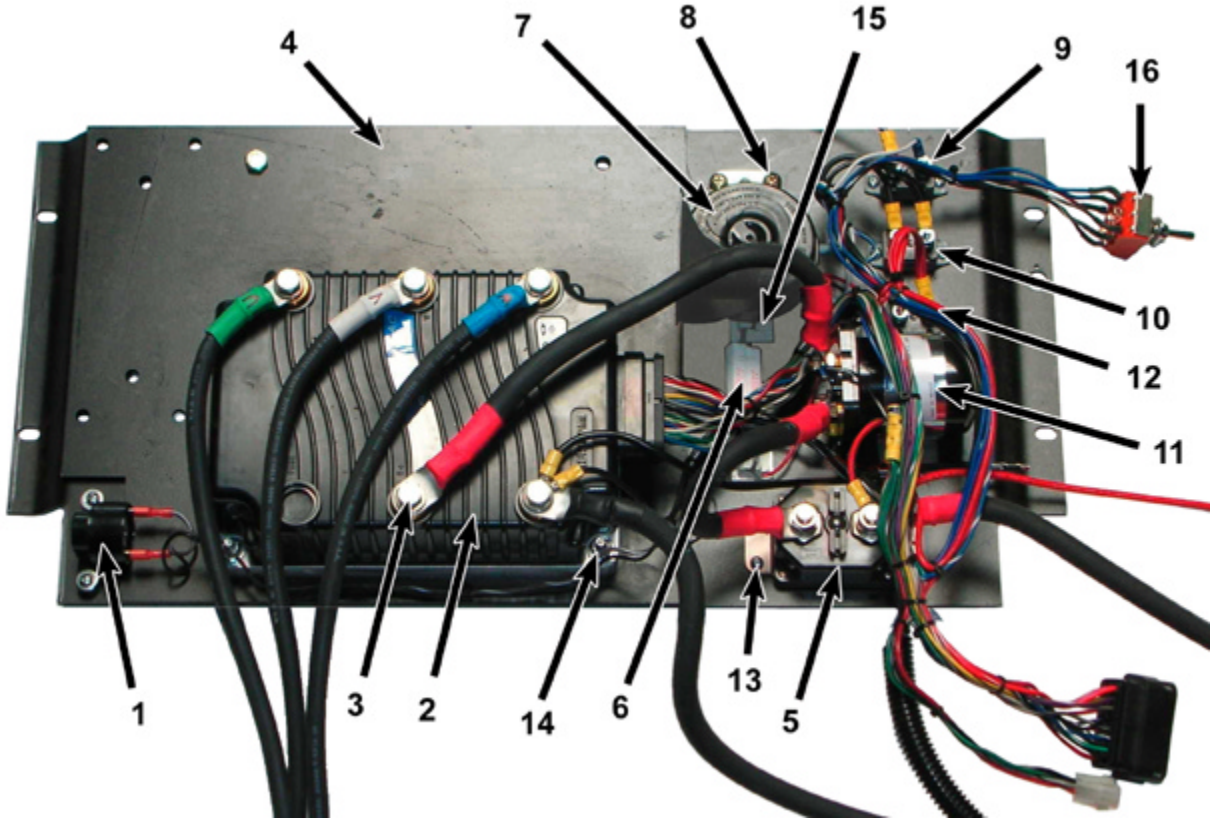


Wire Harnesses

PART #	DESCRIPTION	QTY
75-153-08	Dash harness	1
75-153-04	Cable, Spy Glass	
75-153-07	Main control h1arness	1
75-153-05-60	Control panel	1
75-153-06	Power	1

Instrument Panel			
ITEM #	PART #	DESCRIPTION	QTY
1	71-102-15	Horn switch	1
2	71-039-02	F&R switch	1
3a	71-039-11	Light switch	1
3b		High / Low speed switch	1
4	74-010-20	Gauge, Spy Glass	1
5	71-100-00	Auxiliary switchs	0, 1, 2
6	71-120-00	Start switch (standard)	1
	71-119-99	Spacer	1
	71-121-20	Start switch (keyed unalike, optional)	1
7	71-120-14	Emergency stop switch	1
8	94-304-11	Dash panel	1
9	88-817-07	Screw	6
10	02-546-02	Dash housing	1
Not shown	97-211-20	U-Nut	2
	97-211-20	Plug, 1/2" hole	0, 1, 2

Speed Control Panel



B 2-48 shown

Speed Control Panel			
ITEM #	PART #	DESCRIPTION	QTY
1	73-005-01	Motion alarm	1
2	62-400-35*	Motor speed control, B 2-48	1
	62-400-11*	Motor speed control, B 2-54	1
3	89-080-16	8mm x 1.25 x 16mm Hex bolt	5
	89-060-17	8mm Lock washer	5
4	02-425-17	Controller base, 1/4 plate	1
	02-425-18	Mounting panel	1
5	79-844-20	Circuit breaker, Main 200A	1
6	78-307-25	Resistor (included with harness)	2
7	73-004-20	Horn	1
8	88-838-06	#14 x 1/2 Screw	4
9	79-840-20	Circuit breaker, 12-volt 20A	1
10	79-840-00	Circuit breaker, B- 10A	1
11	72-501-42	Line contactor, B 2-48	1
	71-210-13	Line contactor, B 2-54	1
12	79-840-20	Circuit breaker, B+ 20A	1
13	88-818-06	#8 x 1/2 Screw	10
14	88-060-14	1/4 X 1-1/2 NC HEX HD SCR	4
	88-069-81	Hex nut	4
	88-068-61	1/4 SAE Flat washer	4
15	96-650-02	Clip	2
16	71-120-30	Brake bypass switch (included with harness)	
Not shown	75-442-64	Support, Harness connector	1

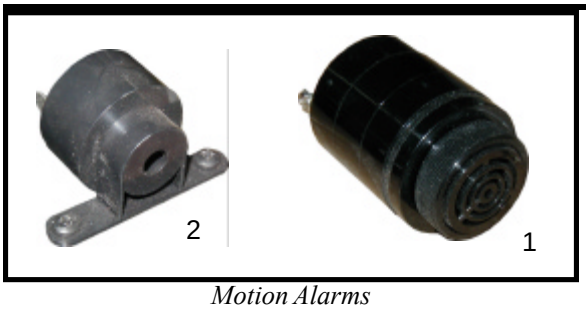
** - Use 94-422-21 Heat sink paste on base of controller and controller base*

Resetting the Maintenance Meter Function

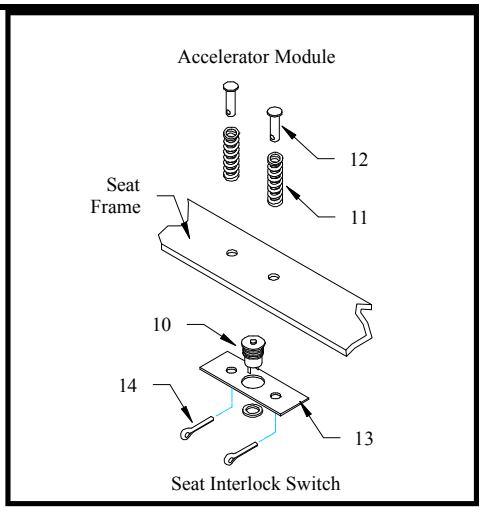
NOTE: The Maintenance meter function is optional.

The controller handset is required to reset the Maintenance meter. Refer to the Appendix for the part number of the handset.

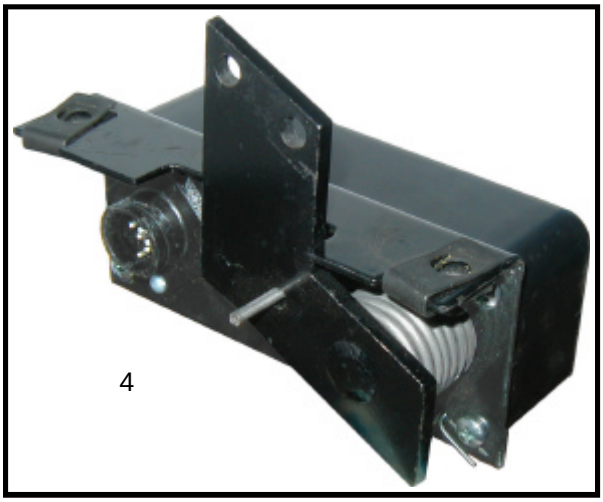
Miscellaneous Electrical



Motion Alarms

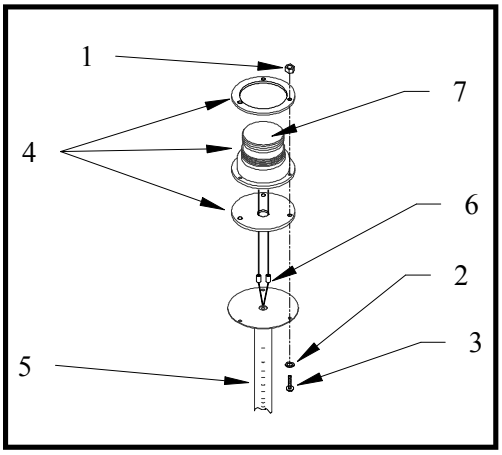


Miscellaneous Wire Harness Clamps

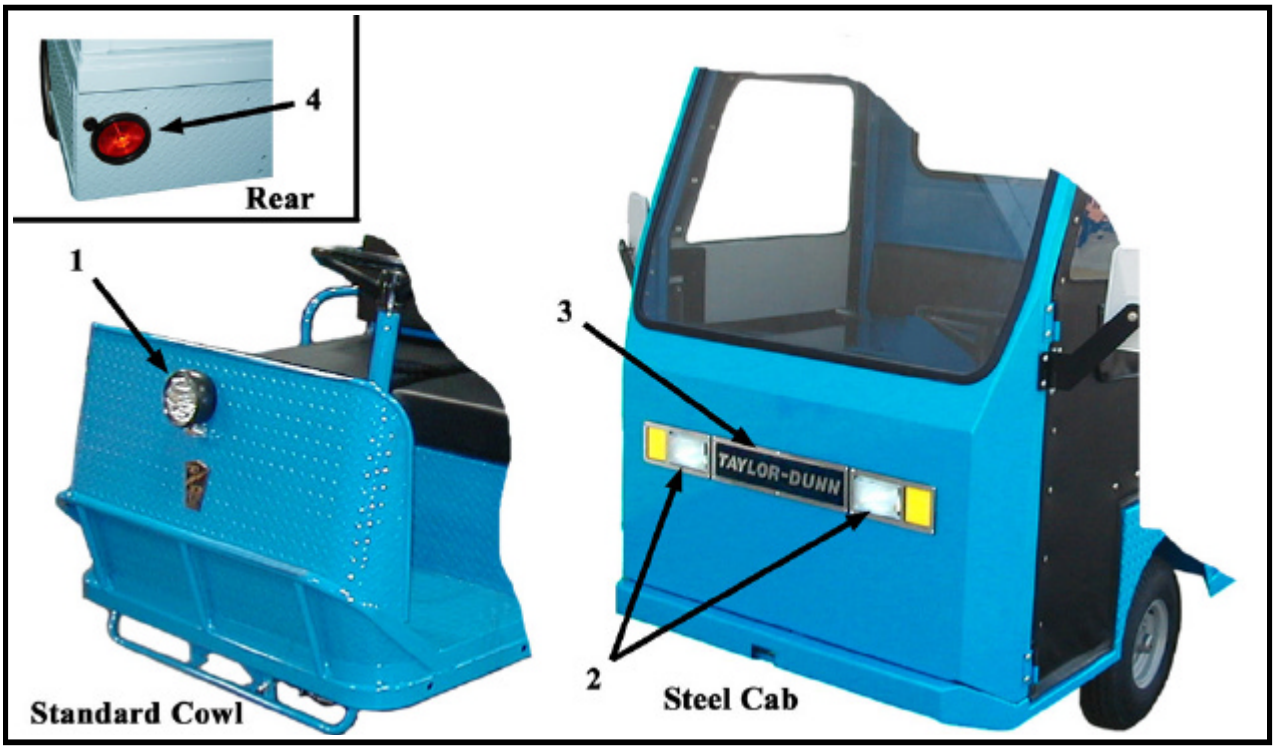


Miscellaneous Electrical			
ITEM #	PART #	DESCRIPTION	QTY
Not Shown			
	98-599-15	Plastic grommet for 1.75 hole	
	98-599-20	Plastic Grommet for 2.5 hole	
	75-107-10	Potratble Charger Harness	1
	76-013-00	Portable Charger Receptacle	1
	72-015-00	Dome light (optional)	1
	78-321-10	(optional)	1
	75-105-25	Harness, Dome light	1
1	73-005-05	Reverse Warning alarm	1
2	96-650-01	Wire Harness Clip, stick on	
3	96-642-00	Wire ahrness Clip, push mount	
4	62-033-48	Throttle Module, 48-volt system	1
	62-033-47	Throttle module, 72-volt system	1
5	71-122-20	Horn Switch	1
6	88-065-06	1/4-NC x 21/2 Phillips Truss Head Screw, Horn Switch	2
7	88-069-81	1/4-NC Hex Nylon Locknut, Horn Switch	2
8	71-111-00	Brake Light Switch	1
9	88-045-06	10-32 x 1/2 Machine Screw, brake light switch	2
10	71-102-10	Seat interlock Switch	1
11	85-030-00	Spring	2
12	96-773-10	Clevis Pin	2
13	02-610-18	Mounting Plate	1
14	88-527-11	Cotter Pin	2
15	96-640-00	Clamp, 3/16 Push Mount	
16	96-629-80 (not shown)	Clamp, Rubber Lined 3/16 ID	
	96-630-00 (not shown	Clamp, Rubber Lined 5/8 ID	
	96-630-50 (not shown	Clamp, Rubber Lined 5/8 ID (.265 mounting hole)	
	96-631-00 (not shown	Clamp, Rubber Lined 3/4 ID	
	96-631-10 (shown)	Clamp, Rubber Lined 1.0 ID	
	96-631-15 (not shown	Clamp, Rubber Lined 1-1/2 ID	
17	96-624-00	Clamp, 1/4 Jiffy Clip	
	96-625-00 (not shown)	Clamp, 5/16 Jiffy Clip	
18	96-626-00	Clamp, 7/8 Jiffy Clip	
	73-005-10	ALARM,REV,BULLARD MPA-II, 97DB (optional)	
	77-055-01	Low battery water level alarm (optional)	

Lighting



Stobe Light

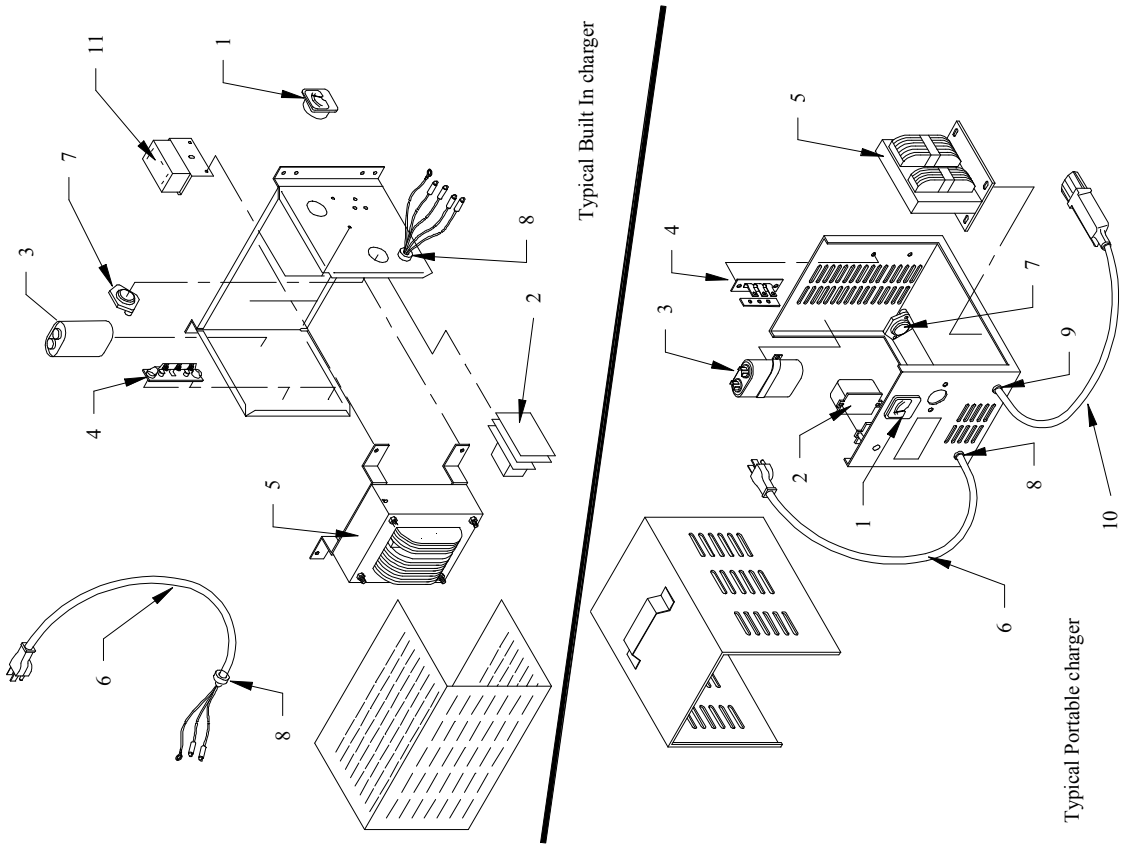


Strobe Light			
ITEM #	PART #	DESCRIPTION	QTY
1	88-029-80	8-32 Hex nut	3
2	88-028-62	#8 lock washer	3
3	88-025-06	8-32 x 1/2 Machine screw	3
4	72-023-20	Strobe assembly (amber)	1
5	*	Mounting pole or mounting plate	1
6	*	Harness	1
7	72-023-22	Amber lens	1
	72-023-23	Red lens	1
Not shown	72-023-21	Replacement bulb	1
* -There are many special order types of mounting configurations. Contact your Taylor-Dunn distributor with the serial number of the vehcle for more information.			

Head and Tail Lights			
ITEM #	PART #	DESCRIPTION	QTY
1	72-005-00	5" Round head light	1 or 2
	72-072-00	Replacement bulb	1 or 2
2	94-050-10	Rectangular light , left (steel cab)	1
	94-050-11	Rectangular light , right (steel cab)	1
	72-082-01	Replacement bulb	2
3	94-201-10	Name plate	1
4	72-022-00	Tail light	1 or 2
	72-022-51	Tail ligh rubber grommet	1 or 2
	72-022-52	Tail light pigtail	

Turn Signals			
ITEM #	PART #	DESCRIPTION	QTY
-	72-051-00	Front lights(standard cowl)	2
-	72-082-10	Front bulb (steel cab)	2
-	72-082-20	Light socket (steel cab)	2
-	71-141-22	Turn signal switch (includes flasher)	1
	98-330-50	Insulator for turn signal switch	1
-	71-900-05	Flasher	1
-	72-405-00	Front light guard (standard cowl)	1

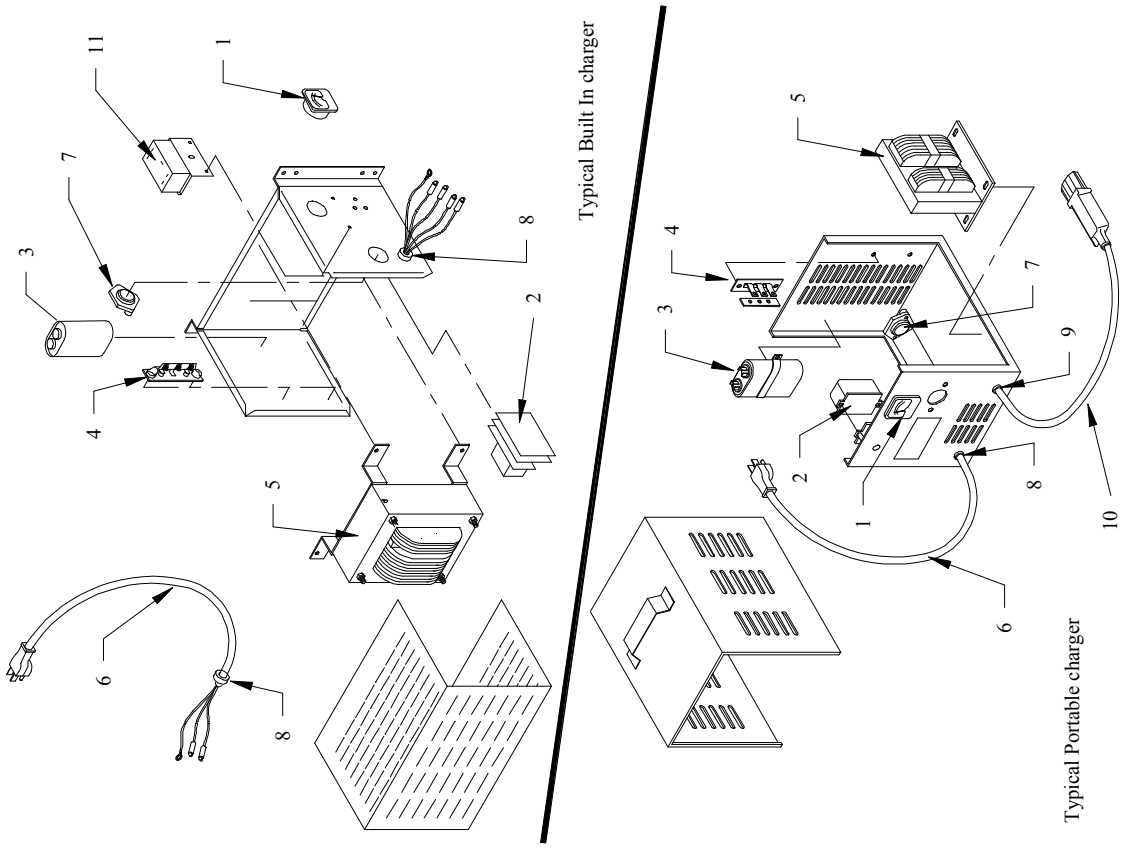
Lestronic® Charger (page 1)



CHARGERS

ITEM #	DESCRIPTION	Charger Model # / Charger Part #									
		22740 79-303-15	7710-32 79-305-20	11860 79-304-65E	22640 79-303-20	9695 79-309-00		9475-31 79-306-21	16910 79-309-10	22620 79-303-25	16920 79-309-20
	Charger Type	36LC25-8ET	36LC25-8ET	36LC25-8ET	36LC40-8ET	48LC25-8ET		36LC40-8ET	48LC25-8ET	48LC25-8ET	48LC25-8ET
	AC Voltage/Amps	**115/60/12**	**115/60/12**	**230/50/na**	**150/60/16**	**115/60/15**		**115/60/17**	**115/60/15**	**115/60/15**	**230/50/na**
	DC Voltage/Amps	**36/25**	**36/25**	**36/25**	**36/40**	**48/25**		**36/40**	**48/25**	**48/25**	**48/25**
	Style	**Built-In**	**Portable**	**Built-In**	**Built-In**	**Portable**		**Portable**	**Built-In**	**Built-In**	**Built-In**
1	Ammeter	**-**	**79-851-10**	**79-851-10**	**79-852-00**	**79-851-10**		**79-852-00**	**-**	**-**	**-**
2	Timer Assembly	**79-805-67**	**79-805-69**	**79-805-72**	**79-805-67**	**79-805-65**		**79-805-67**	**79-805-68**	**79-805-68**	**S/O**
	Relay for #2	**79-808-00**	**79-808-00**	**79-808-00**	**79-808-00**	**79-808-20**		**79-808-00**	**79-808-20**	**79-808-20**	**79-808-20**
3	Capacitor	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**		**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**
4	Diode Assembly	**79-749-13**	**79-749-13**	**79-749-11**	**79-749-10**	**79-749-13**		**79-749-10**	**79-749-13**	**79-749-13**	**79-749-13**
5	Transformer	**79-644-31**	**S/O**	**S/O**	**S/O**	**S/O**		**S/O**	**S/O**	**79-603-10**	**S/O**
6	AC Cord	**-**	**S/O**	**-**	**-**	**79-575-10**		**79-575-10**	**-**	**-**	**N/A**
7	Fuse Assembly	**79-831-00**	**79-831-00**	**79-831-00**	**79-831-10**	**79-831-00**		**79-831-00**	**79-831-00**	**79-831-00**	**79-831-00**
8	Strain Relief	**79-530-00**	**79-531-00**	**79-530-00**	**79-530-00**	**79-730-00**		**79-530-00**	**79-530-00**	**79-530-00**	**79-530-00**
9	Strain Relief	**-**	**79-530-00**	**-**	**-**	**79-730-00**		**79-531-00**	**-**	**-**	**-**
10	DC Cord	**-**	**79-566-10**	**-**	**-**	**79-566-10**		**S/O**	**-**	**-**	**-**
11	Interlock Relay Assy.	**79-809-60**	**-**	**79-306-23**	**79-809-50**	**-**		**-**	**-**	**79-809-50**	**-**
-	Replacement AC Plug	**76-200-00**	**76-200-00**	**-**	**76-200-00**	**76-200-00**		**76-200-00**	**76-200-00**	**76-200-00**	**N/A**

Lestronic® Charger (page 2)



CHARGERS

ITEM #	DESCRIPTION	Charger Model # / Charger Part #									
		14400-31 79-302-50	7105-01 79-300-50	12750 79-300-55E	13110 79-301-10	9513-31 79-302-10	13760 79-302-15	22730 79-303-05	7030 79-304-60	12315 79-306-90	
	Charger Type	24LC40-8ET	24LC25-8ET	24LC25-8ET	24LC25-8ET	24LC40-8ET	24LC40-8ET	24LC25-8ET	36LC25-8ET	36LC40-8ET	
	AC Voltage/Hz/Amps	**230/50/7**	**230/50/4**	**230/50/4**	**115/60/9**	**115/60/13**	**115/60/13**	**115/60/8**	**230/50/7**	**230/50/8**	
	DC Voltage/Amps	**24/40**	**24/25**	**24/25**	**24/25**	**24/40**	**24/40**	**24/25**	**3625**	**36/40**	
	Style	**Portable**	**Portable**	**Built-In**	**Portable**	**Portable**	**Built-In**	**Built-In**	**Portable**	**Portable**	
1	Ammeter	**79-852-00**	**79-851-10**	**-**	**79-851-10**	**79-852-00**	**-**	**-**	**79-851-10**	**79-852-00**	
2	Timer Assembly	**S/O**	**79-805-64**	**79-805-70**	**79-805-64**	**79-805-64**	**79-805-66**	**79-805-66**	**K4-071-87**	**K4-071-87**	
	Relay for #2	**79-808-10**	**79-808-10**	**79-808-10**	**79-808-10**	**79-808-10**	**79-808-10**	**79-808-10**	**79-808-00**	**79-808-00**	
3	Capacitor	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	**79-902-00**	
4	Diode Assembly	**S/O**	**79-749-13**	**79-749-13**	**S/O**	**79-749-13**	**79-749-13**	**79-749-13**	**79-749-13**	**79-749-10**	
5	Transformer	**S/O**	**S/O**	**79-644-08**	**S/O**	**S/O**	**S/O**	**S/O**	**S/O**	**S/O**	
6	AC Cord	**S/O**	**S/O**	**-**	**S/O**	**79-575-10**	**-**	**-**	**S/O**	**S/O**	
7	Fuse Assembly	**79-831-10**	**79-831-00**	**79-831-00**	**79-831-00**	**79-831-10**	**79-831-10**	**79-831-10**	**79-831-00**	**79-831-00**	
8	Strain Relief	**S/O**	**79-532-00**	**79-530-00**	**79-532-00**	**79-531-00**	**79-531-00**	**79-531-00**	**79-532-00**	**79-532-00**	
9	Strain Relief	**S/O**	**79-530-00**	**-**	**79-530-00**	**79-530-00**	**-**	**-**	**79-530-00**	**79-530-00**	
10	DC Cord	**79-567-10**	**79-566-10**	**-**	**79-566-10**	**S/O**	**-**	**-**	**S/O**	**79-567-10**	
11	Interlock Relay Assy.	**-**	**-**	**79-306-23**	**-**	**-**	**-**	**79-809-60**	**-**	**-**	
-	Replacement AC Plug	**-**	**-**	**-**	**76-200-00**	**76-200-00**	**76-200-00**	**76-200-00**	**-**	**-**	

Signet® Charger

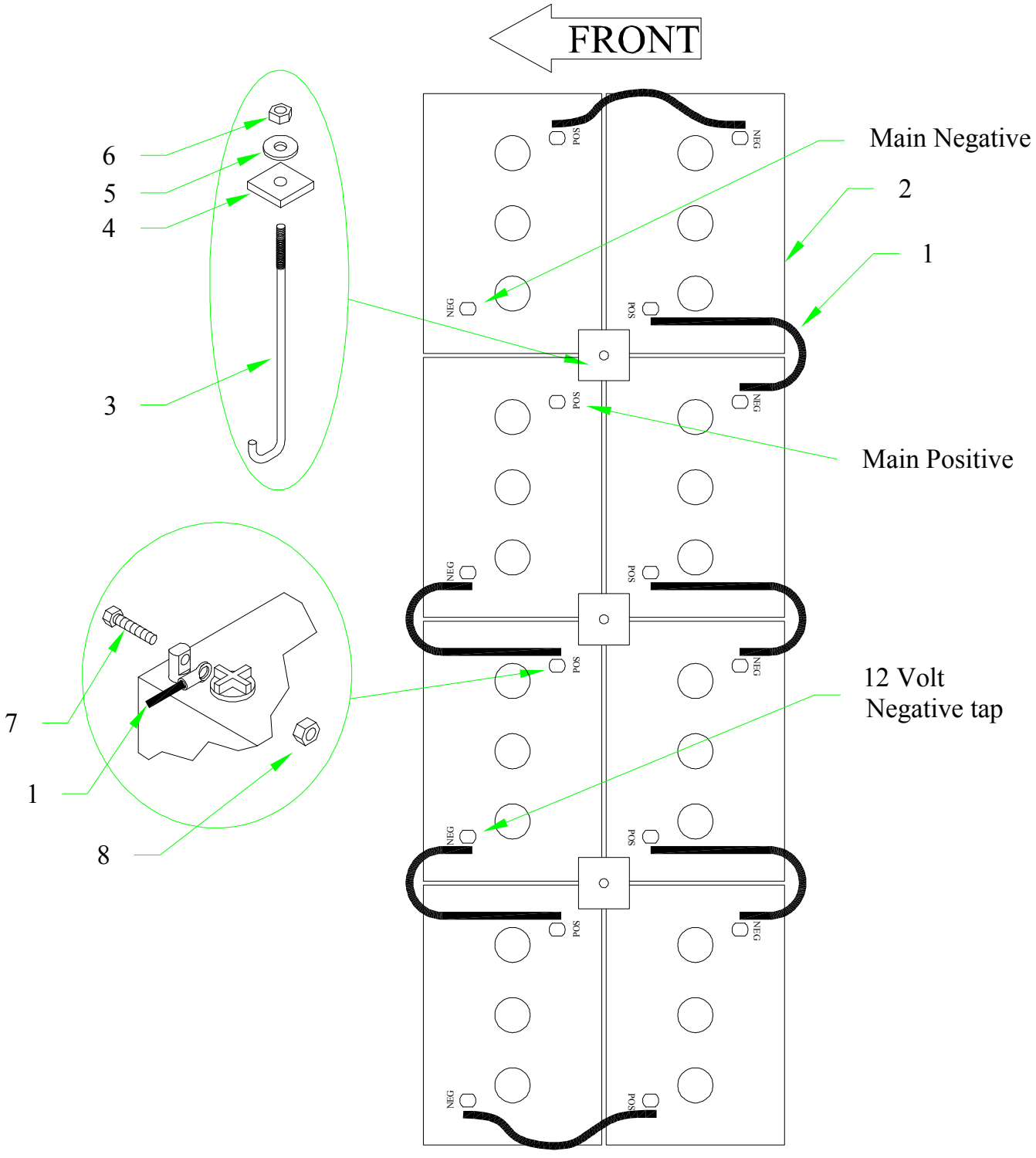
Portable Charger Wiring

PART #	DESCRIPTION	QTY
75-107-10	HRNSS,PORTABLE/LESS CHRGER	1
JF3-86181-00-00	RECEPTACLE, W/INTERLOCK	1
90157-05M19-00	Mounting hardware for receptacle	2
92907-05100-00		4
92907-05600-00		4
98507-05035-00		2

Signet® Charger			
ITEM #	PART #	DESCRIPTION	QTY
	79-309-40	Charger assembly,incudes AC cord with out plug (see note below)	1
Note: There are no user serviceable components inside the charger			

NOTE: The harness connectors are not included with the charger. When replacing the charger order 2 each of the following:	
PART #	DESCRIPTION
75-318-20	Butt splice
75-320-51	Knife connector

Batteries

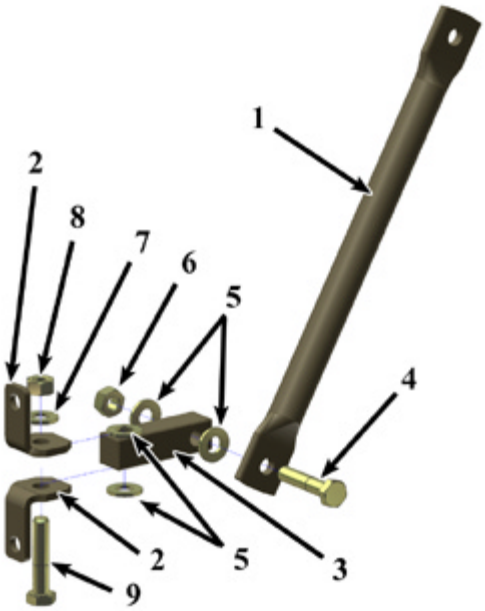

FRONT
6
5
4
3
Main Negative
2
1
Main Positive
7
1
8
12 Volt
Negative tap
POS
NEG

Batteries			
ITEM #	PART #	DESCRIPTION	QTY
1	75-237-00	Batteru jumper	*
2	77-042-00	217AH, T-105	*
	77-042-50	217AH, TD-217	*
	77-042-80	217AH, T-105 Moist charge (dry)	*
	77-044-00	230AH, T-125	*
	77-044-10	195AH, Mainenance free (Note: requires special charger)	*
	77-047-00	244AH, T-145	*
	77-047-50	250AH, TD-250	*
	77-047-80	244AH, T-145 Moist charge (dry)	*
	77-048-00	250AH, J-250	*
	77-048-80	250AH, J-250 Moist charge (dry)	*
	77-051-00	160AH Gell (Note: requires special charger)	*
3	50-243-10	Battery rod	*
4	50-250-00	Battery hold down	*
5	88-088-66	Flat washer, tin/lead plated	*
6	88-069-81	1/2NC Nylon lock nut	*
7	88-081-12	5/16NC x 1 Hex bolt, stainless steel	*
8	88-089-80	5/16NC Hex nut, stainless steel	*
9	88-089-70	5/16 Split lock washer, stainless steel	*
Not shown	77-055-15	Battery wattering system for Trojan batteries (optional)	
	77-055-12	Battery wattering system for Exide or Taylor-Dunn batteries (optional)	
	77-055-13	BATTERY FILLING GUN, used with watering systems (optional)	
	01-534-43	Battery locator (angle in bottom of battery box)	1
*	Quantities depend on voltage configuration of vehicle.		

Seat Cushions and Deck

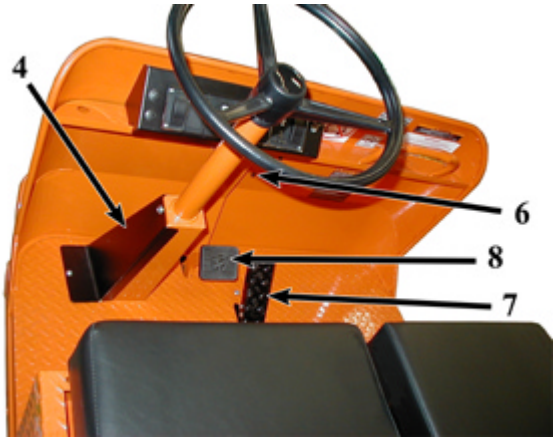
Seats and Deck			
ITEM #	PART #	DESCRIPTION	QTY
1	90-148-00	Passenger seat cushion (standard)	1
	90-172-00	Passenger seat cushion (with steel cab)	1
2	90-140-00	Seat back (standard)	1
	90-179-00	Seat back (with steel cab)	1
	90-142-00	Seat back (1/2 cowl frame)	1
3	90-148-00	Driver seat cushion (standard)	1
	90-172-00	Driver seat cushion (with steel cab)	1
4	90-444-00	Deckboard, 75-1/4 x 41 (standard bed)	1
	90-466-10	Deckboard, 19-1/2 x 41	1
	90-467-10	Deckboard, 55-3/4 x 41	1
	90-466-00	Deckboard, 21-3/4 x 41 (fold away seat option)	1
	90-468-00	Deckboard, 32-3/4 x 41 (fold away seat option)	1
	90-469-00	Deckboard, 19-11/16 x 41 (f oldaway seat option)	1
	90-464-00	Deckboard, 55 x 41 (fold away seat option)	1
	90-441-00	Deckboard, 37-1/2 x 41	1
	90-440-43	Diamond plate deck cover, 32-3/4 x 41	1
	90-440-50	Diamond plate deck cover, 19-1/2 x 41	1
	90-440-54	Diamond plate deck cover, 55-3/4 x 41	1
	90-440-53	Diamond plate deck cover, 19-11/16 x 40-1/2	1
	90-440-56	Diamond plate deck cover, 21.750 x 41	1
	88-607-09	Rivet, diamond plate deck	-
	95-530-10	Handle, fold away seat	1
5	90-140-00	Seat back	1
	90-107-01	Seat frame	1
6	90-134-00	Seat cushion	1
7	90-108-20	Rerar step	1
8	90-134-00	Seat cushion (fold away seat)	1
	90-149-00	Seat cushion (fixed seat)	
9	90-140-00	Back rest	1
10	90-542-01	End gate	1
	90-542-06	Left gate , 75"	1
	90-542-05	Right gate, 75"	1
	90-542-03	Left gate, 37-1/4	1
	90-542-02	Right gate, 37-1/4	1
	90-542-04	Left gate, 37-1/2"	1
	90-542-07	Right gate, 37-1/2"	1
11	90-101-50	Seat frame, lower (unpainted)	1
	90-101-51	Seat frame, upper (unpainted)	1

Mirrors



92-202-00 Assembly

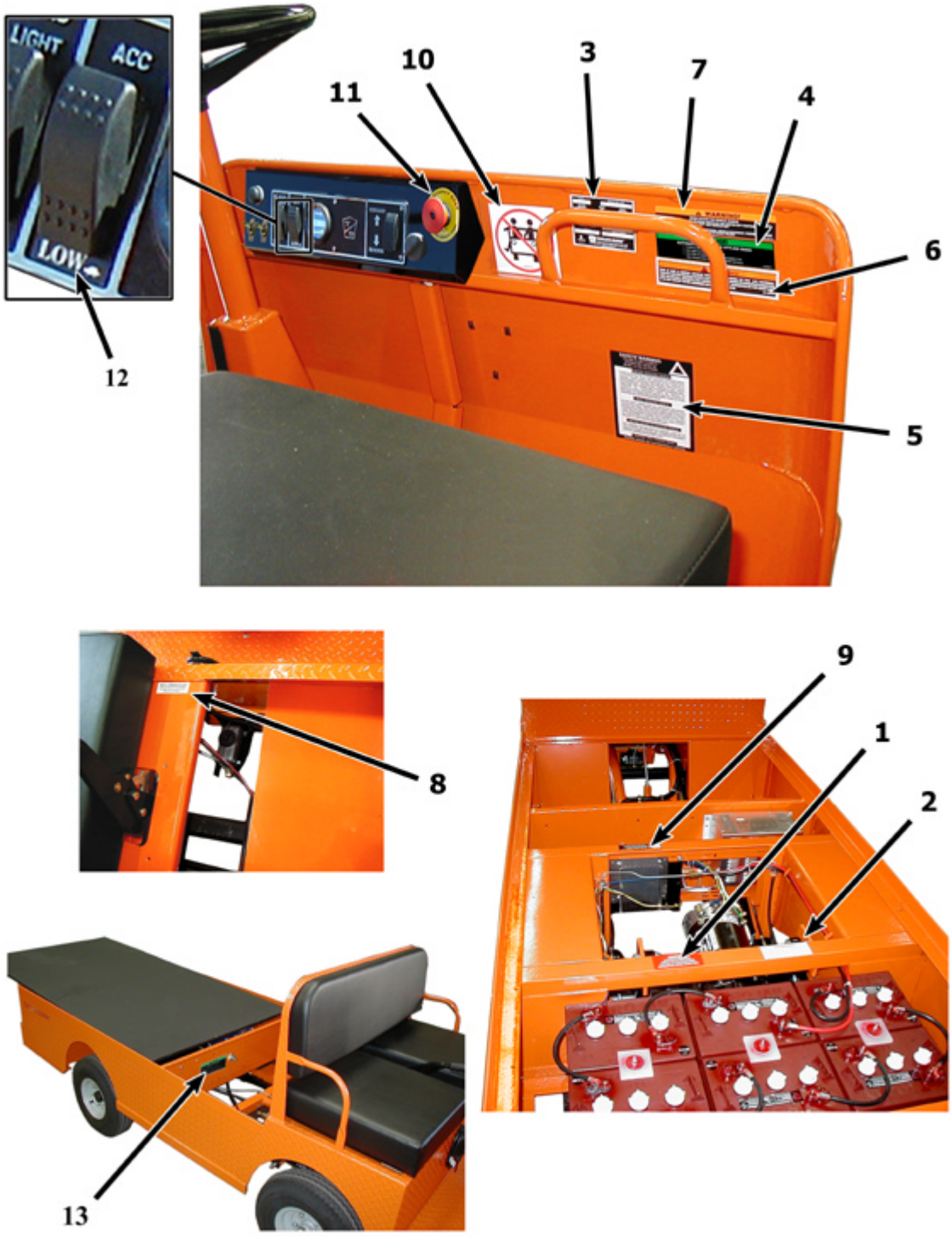
Miscellaneous Frame Components



Mirrors			
ITEM #	PART #	DESCRIPTION	QTY
-	92-201-00	Mirror, rectangular, 4-1/2 x 8-1/2 (side view)	
-	92-202-12	Mounting bracket, left	
-	92-202-13	Mounting bracket, right	
-	91-814-16	Hinge, left (used with 92-202-12)	
-	91-814-17	Hinge, right (used with 92-202-13	
-	92-202-15	Spacer (used with 92-202-12 and -13)	
-	92-207-00	Mirror, multi-panel (inside cab)	
-	91-810-00	Mounting tab for multi-panel mirrir	2
-	97-176-00	Washer, Neoprene	2
-	92-206-00	Mirror, rectangular, 5-1/2 x 8 (inside cab)	
-	02-210-70	Bracket for 92-206-00	
	92-202-00	Mirror mountingr bracket assembly	
1	92-202-21	Arm	1
2	92-202-23	Bracket	2
3	92-202-22	Joint	1
4	88-080-14	5/16NC x 1-1/2 Hex bolt	1
5	88-088-61	5/16 SAE flat washer	4
6	88-089-81	5/16NC Lock nut	1
7	88-088-62	5/16 Split lock washer	1
8	88-089-80	5/16NC Hex nut	1
9	88-080-14	5/16NC x 1-1/2 Hex bolt	1

Miscellaneous Frame Components			
ITEM #	PART #	DESCRIPTION	QTY
1	79-511-00	Charger AC cord holder	1
2	79-530-00	Charger AC cord strain releif	1
3	79-575-25	Charger cord, Lester charger only	1
4	30-807-00	COVER,STEERING GEAR SUPT	1
5	94-201-00	TAYLOR-DUNN EMBLEM	1
6	88-567-91	Clip for TD Emblem	3
7	01-110-20	Throttle pedal	1
8	98-200-00	Rubber brake pedal pad	1

Decals



Decals			
ITEM #	PART #	DESCRIPTION	QTY
1	94-319-00	Battery disconnect	1 or 2
2	94-313-00	Battery warning	1 or 2
3	94-373-10	Vehicle identification	1
4	94-384-21	Brake warning	1
5	94-313-20	Safety warning	1
6	94-384-01	Not a motor vehicle	1
7	94-384-14	When leaving vehicle warning	1
8	94-301-41	Brake fluid	1
9	94-384-17	Do not wash	1
10	94-301-42	Arms and legs	1
11	94-384-24	Emergency stop	1
12	94-384-15	Low speed	
13	94-384-06	Emergency brake bypass switch	1

Cab Options

Steel Cab

Fiberglass cab

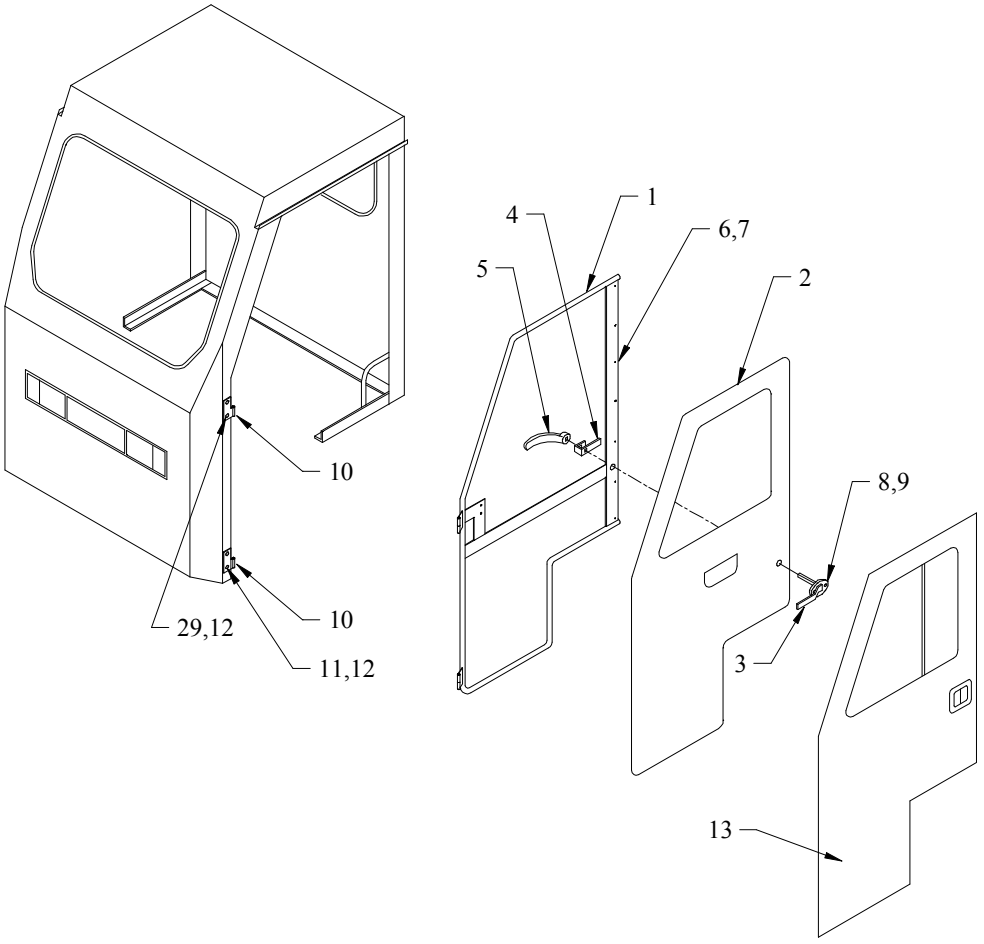
Steel Cab			
ITEM #	PART #	DESCRIPTION	QTY
-	91-012-00	Steel cab (unpainted)	1
-	90-852-30	Front windshield	1
-	90-850-10	Rear window	1
-	98-310-00	Rubber windshield gasket (by the foort)	-

Fiberglass Cab			
ITEM #	PART #	DESCRIPTION	QTY
-	91-000-00	Fiberglass cab	1
-	90-800-00	Front windshield	1
-	90-850-00	Rear window	1
-	98-310-10	Rubber windshiel gasket (by the foot)	-
-	94-035-01	Plastic door trim (by the foot)	-
-	90-908-50	Filler panel	2

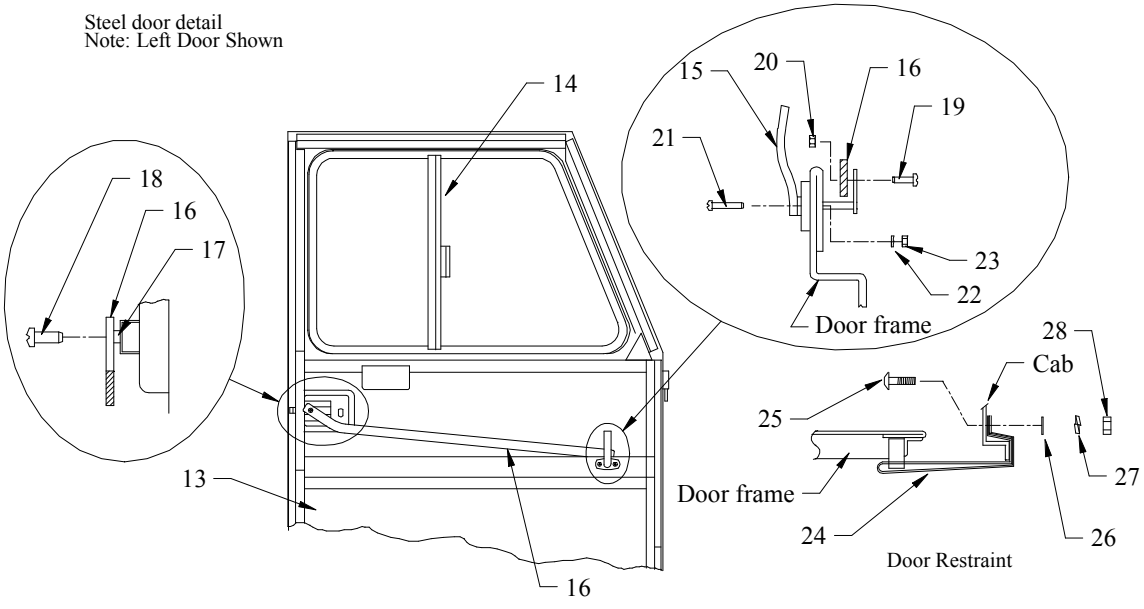
Fiberglass Windshield Frame (illustration not available)			
ITEM #	PART #	DESCRIPTION	QTY
	90-800-00	Windshield	1
	91-006-00	Fiberglass frame	1
	91-029-00	Support bracket	2
	98-310-10	Rubber channel	10'

Windshield Wiper (illustration not available)			
ITEM #	PART #	DESCRIPTION	QTY
	74-050-00	Wiper motor	1
	74-051-00	Wiper arm	1
	74-052-00	Wiper blade	1
	75-152-09	Harness	1

Door Options, Steel Cab



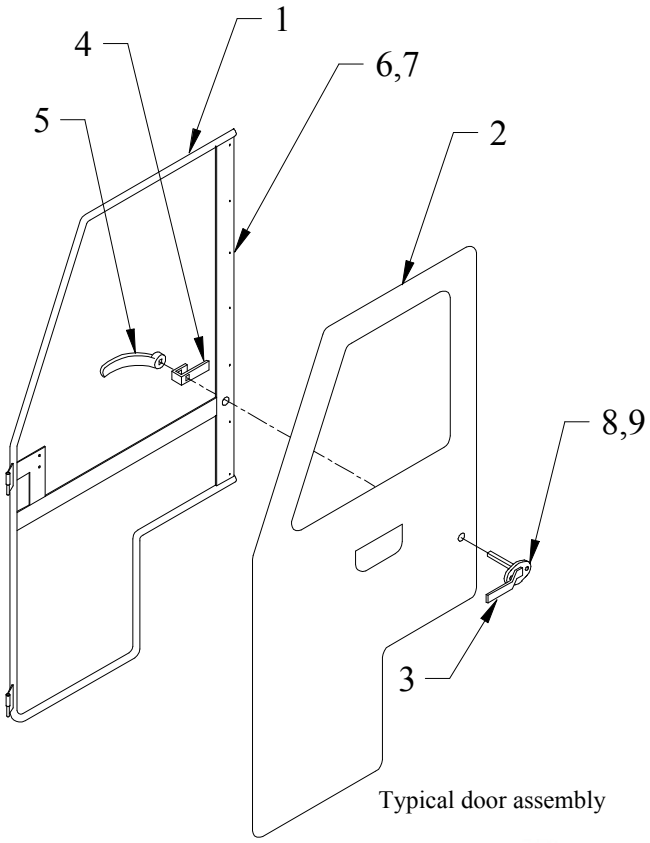
Steel door detail
Note: Left Door Shown



Cab Doors Naugahyde (Steel cab)			
ITEM #	PART #	DESCRIPTION	QTY
1	90-923-98	Door Frame, Left	1
Not shown	90-923-99	Door Frame, Right	1
2	90-924-98	Side Curtain, Left	1
Not shown	90-924-99	Side Curtain Right	1
3	97-315-53	Handle Assembly, Outer	2
4	97-315-51	Door Latch	2
5	97-315-54	Handle Assembly Inside	2
6	97-303-03	Snap Fastner	14
7	88-727-06	Rivet, 5/32 X 5/8"	14
8	88-025-08	Screw, #8-32 X 5/8", Truss Head	4
9	88-029-86	Locknut, #8-32"	4
10	91-814-10	Hinge, Female, Left (naugahyde and steel doors)	2
Not shown	91-814-11	Hinge, Female, Right (naugahyde and steel doors)	2
11	88-082-09	Bolt, 5/16 X 5/8", Carriage	8
12	88-089-81	Locknut, 5/16" NC	8

Cab Doors Steel (Steel cab)			
ITEM #	PART #	DESCRIPTION	QTY
Not Shown	91-011-66	Kit, Cab Door, Left, Specify Color (includes #10, 11,12)	1
	91-011-68	Kit, Cab Door, Left, Orange (includes #10, 11,12)	1
	91-011-67	Kit, Cab Door, Right, Specify Color (includes #10, 11,12)	1
	91-011-69	Kit, Cab Door, Right, Specify Color (includes #10, 11,12)	1
14	90-853-10	Window, Left	1
Not Shown	90-853-11	Window, Right	1
15	97-315-58	Door Handle, Inner	2
16	91-012-12	Connecting Bar	2
17	16-510-00	Spacer	2
18	88-065-06	Screw, 1/4 X 1/2" NC, Phillips Truss Head	2
19	88-045-08	Screw, #10-32 X 5/8", Truss Head	2
20	88-049-86	Locknut, #10-32	2
21	88-045-11	Screw, #10-32 X 1", Truss Head	4
22	88-048-62	Lock Washer, #10	4
23	88-049-80	Nut, #10-32	2
24	91-012-45	Strap, Door Restraint	2
25	88-082-11	Bolt, 5/16 NC X 1" Carriagee	2
26	88-088-60	Washer, 5/16 Cut	2
27	88-088-62	Lock Washer, 5/16"	2
28	88-089-83	Acorn Nut, 5/16" NC	2
29	91-011-31	Door Weldment, Left (unpainted)	1
Not Shown	91-011-32	Door Weldment, Right (unpainted)	1
	98-454-00	Weatherstrip (by the foot)	27

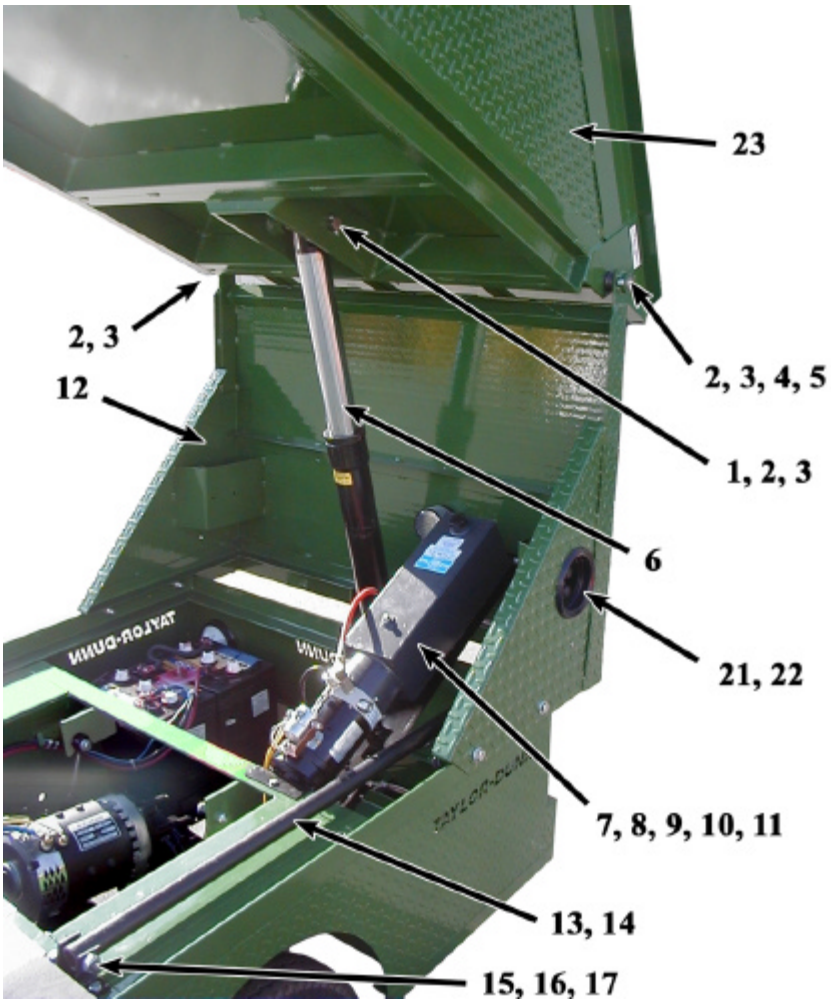
Door Options, Fiberglass Cab



Typical door assembly

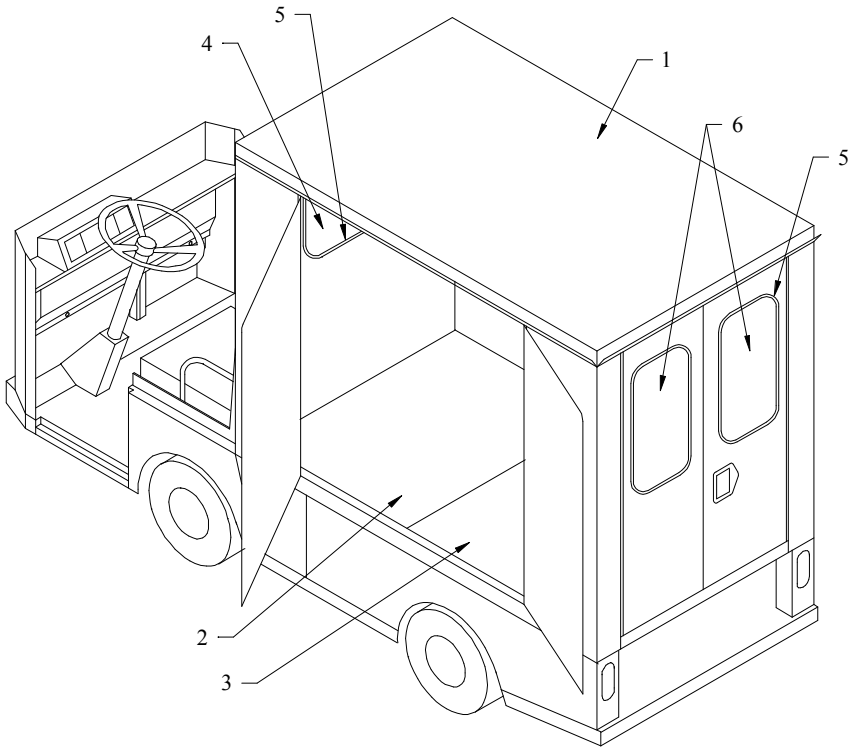
Cab Doors Naugahyde (fiberglass cab)			
ITEM #	PART #	DESCRIPTION	QTY
1	90-921-98	Door Frame, Left	1
	90-921-99	Door Frame, Right	1
	98-451-11	Weather seal tape (by the foot)	-
2	90-908-98	Side Curtain, Left	1
	90-908-99	Side Curtain Right	1
3	97-315-53	Handle Assembly, Outer	2
4	97-315-51	Door Latch	2
5	97-315-54	Handle Assembly Inside	2
6	97-304-50	Snap Fastner	12
7	88-737-08	Rivet, 5/32 X 5/8"	14
8	88-029-86	Locknut, #8-32"	4
9	88-025-08	Screw, #8-32 X 5/8", Truss Head	4
10	-	-	-
11	-	-	-
12	-	-	-
13	-	-	-
14	94-036-00	Drip moulding	1
15	91-810-00	Lower hinge	2
	17-104-00	Collar	2
16	91-809-10	Upper hinge	2

Hydraulic Dump Body Option

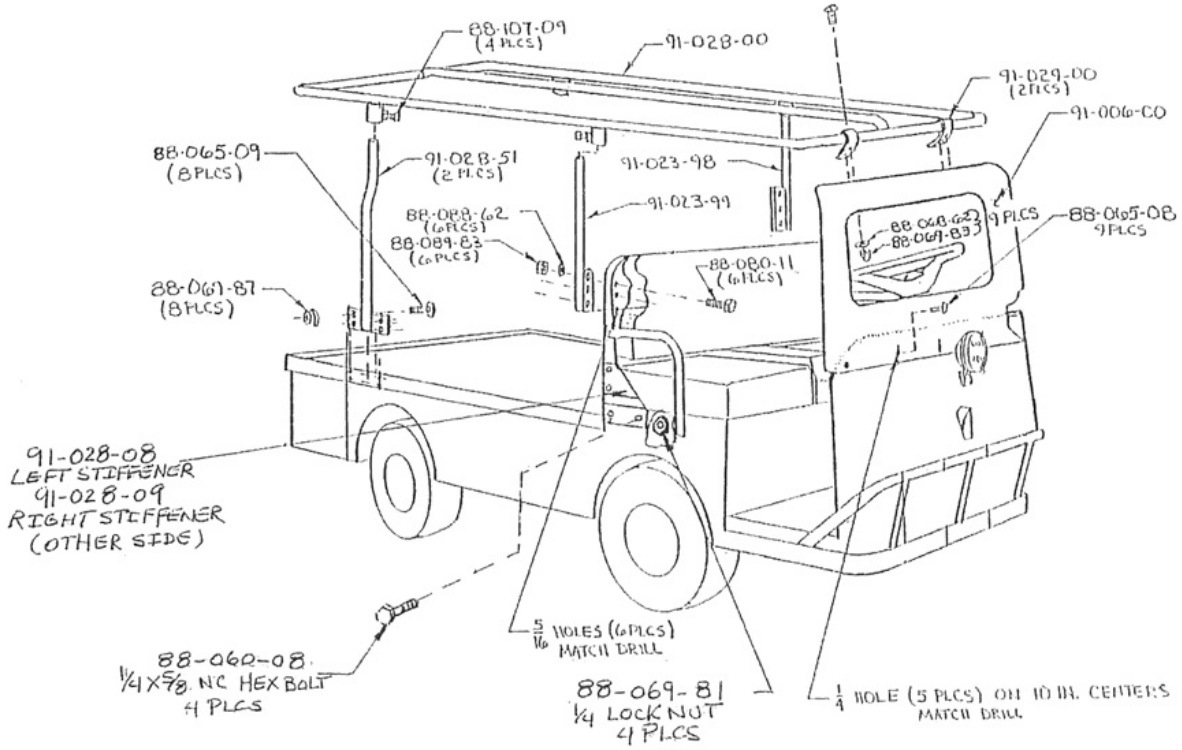


Dump Bed Option			
ITEM #	*PART #*	*DESCRIPTION*	*QTY*
1	21-018-00	Cylinder Pin	1
2	88-060-11	Bolt, 1/4 X 1-1/4" NC, Hex Head	6
3	88-069-81	Locknut, 1/4" NC	6
4	21-019-00	Shaft, Dump Bed Pivot	2
5	17-112-00	Collar, Shaft	2
6	99-524-00	Hydraulic Cylinder	1
7	99-957-00	Hydraulic Pump and Motor	1
8	99-597-09	Bracket, Hydraulic Pump	1
9	88-100-11	Bolt, 3/8 X 1" NC, Hex Head	3
10	88-109-81	Locknut, 3/8" NC	3
11	98-753-08	Isolator Mount, Rubber	3
12	91-286-01	Carrier Frame, Dump Bed	1
13	91-285-11	Safety Prop Rod	1
14	98-754-00	Rubber Bumper, Safety Prop Rod	1
15	91-285-10	Bracket, Safety Prop Rod	1
16	96-244-00	Bolt, 1/2" NC, Hex Head with Grease Fitting	1
17	88-149-81	Locknut, 1/2" NC, Hex Head	1
18	-	-	-
19	-	-	-
20	-	-	-
21	72-022-51	Rubber Mounting Ring	1
22	71-102-15	Switch, Dump Bed	1
23	91-285-01	Dump Bed	1
Not shown	90-442-00	Deckboard	1
	AA-000-11	Fluid, Hydraulic, Dextron 2, Quart	1
	75-124-00	Wire Harness	1
	78-106-00	Buss Bar, Circuit Breaker	1
	79-843-00	Circuit Breaker, 100 AMP, 2 Pole	1
	71-610-02	Circuit breaker mounting plate	1
	99-526-11	Fitting, Adapter 3/8 X 3/8 NPTF	1
	99-527-01	Fitting, Adapter 90^0	2
	99-597-50	Bracket, Hydraulic Pump	1
	99-597-51	Hose Assemble, 24"	1
	77-980-00	BATT BOX,BOLT IN,MODEL-B	1
	77-869-00	BAR,BAT HOLD DOWN	2
	50-240-00	ROD,BATTERY,1/4X36-3/8PLTD	3
	50-241-00	COVER TUBE,BATTERY ROD	1
	01-220-82	SPLASH PAN,CHARGER(DUMP BODY)	1
	94-379-00	TAG,CAPACITY,D-BODY,1000LB	1
	M6-001-00	Manual Supplement, Dump Body	1

Rear Cargo Box



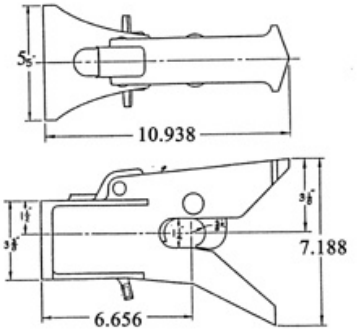
Top Covers



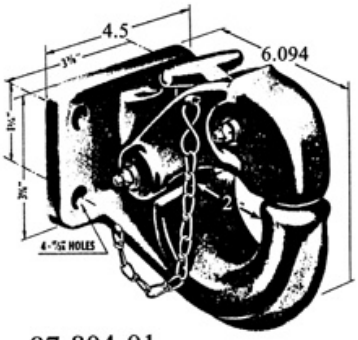
Rear Cargo Box			
ITEM #	PART #	DESCRIPTION	QTY
1	91-333-02	Cargo box (unpainted)	1
2	90-471-00	Front deck board	1
3	90-472-00	Rear deeck board	1
4	90-850-10	Front window	1
5	98-310-00	Ruber window gasket (by the foor)	-
6	90-851-00	Rear window	2
Not shown	94-320-10	Load line decal	1
	00-210-23	Deck support angle	1

Top Covers			
ITEM #	PART #	DESCRIPTION	QTY
	91-151-00	Fiberglass top	1
	94-035-01	PLASTIC TRIM STRIP, SNAP-ON	29'
	91-028-25	Z-BRACKET	6
	96-124-00	U-BOLT,1.75L X 1W X 1/4NC	6
	97-176-00	WASHER,NEOPRENE 3/8X3/4X3/	12
	98-451-00	TAPE,WEATHER STRIP	2'
	91-101-00	Surry top	

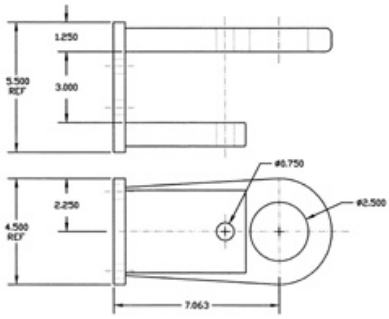
Hitches



97-808-00
Automatic Coupling Hitch

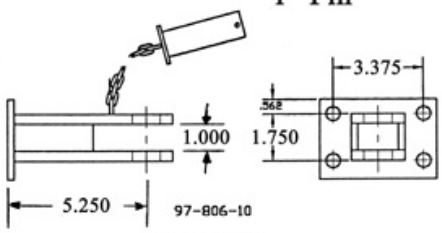


97-804-01
Pintle Hitch

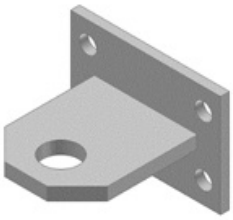


Hook Pin and Eye Hitch
97-809-00

1" Pin



97-806-10
Pin and Clevis Hitch



Ball Hitch Mount
97-805-00 (1-7/8")
97-807-00 (2")

Trailer Hitches			
ITEM #	PART #	DESCRIPTION	QTY
	97-811-00	1-7/8 inch Ball	
	97-821-00	2-inch Ball	
	88-140-14	1/2NC x 1-1/2 Hex bolt	4
	88-149-80	1/2NC Hax nut	4
	88-148-62	1/2 Split lock washer	4

Ladder Rack Option B2-004-66 and B2-006-78“

NOTE: Replacement parts only. Ladder rack cannot be added to an existing vehicle		
PART #	DESCRIPTION	QTY
00-201-44	Ladder rack	1
00-201-49	Ladder rack with stake side pockets	1
88-102-11	3/8 X 1 NC CARRIAGE BOLT	14
88-108-62	3/8 LOCK WASHER	14
88-109-81	3/8 NC LOCK NUT1\	14
90-473-00	Deckboard 52.375 x 40.375	1
90-473-10	Deckboard 22.0 x 40.375	1

TAYLOR - DUNN

Appendixes

Contents

Appendix A: Special Tools 2
Appendix B: Suggested Torque Limits for Standard Hardware 3
Hardware Identification 3
- Standard Head Markings 3
- Hex Bolts 3
- Other Bolts 3
- Hex Nuts 4
- Hex Lock Nuts (stover) 4
- Other Nuts 4
- Suggested Torque Values (non-critical hardware) 5

Appendix C: Brake Lining Handling Precautions 7

APPENDIX A: SPECIAL TOOLS

DESCRIPTION	PURPOSE	PART #
Test Light	Used for testing electrical circuits. Powered by the truck batteries, switchable for 12, 24, 36, and 48 volts.	62-027-00
Accelerator Test Harness	Used to test the solid state accellerator module part number series 62-033-XX.	62-027-31
User level maintenance handset	Used for diagnostics of the AC motor speed control system.	62-027-64
Dealer level maintenance handset	Used for diagnostics and adjusting of the AC motor speed control system.	Start switch (standard)
Disc Brake Boot Installation Tool	Used to install the rubber boot on all disc brake bodies.	41-350-13
Pin Removing Tool	Used to remove pins and sockets from AMP connectors.	75-440-55
Pin Removing Tool	Used to remove pins and sockets from MOLEX connectors.	75-442-55
Hydrometer	Used to check the specific gravity of battery electrolyte.	77-200-00
Battery Filler	Used to safely add water to batteries.	77-201-00

APPENDIX B: SUGGESTED TORQUE LIMITS FOR STANDARD HARDWARE

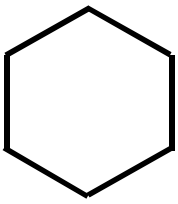
HARDWARE IDENTIFICATION

Standard Head Markings

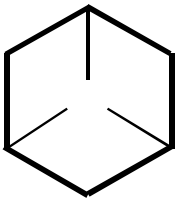
NOTE: Torque value used should be for lowest grade of hardware used. If a grade 2 nut is used on a grade 8 bolt, use grade 2 torque value.

NOTE: Toque values specified are for clean dry threads.

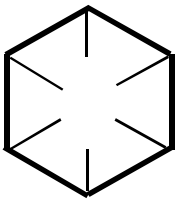
Hex Bolts



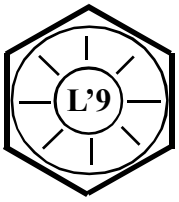
S.A.E. Grade 2



S.A.E. Grade 5



S.A.E. Grade 8



L'9

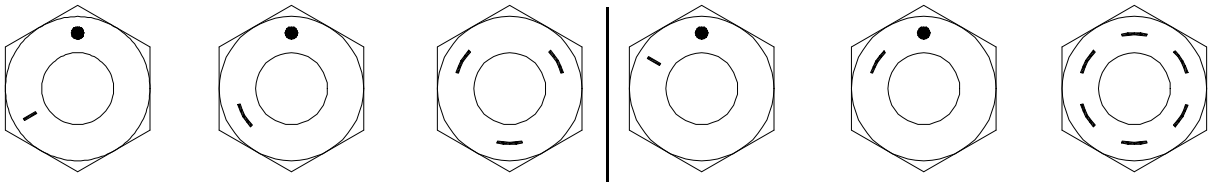
Other Bolts

Truss Head, grade 2

Carriage Bolt, grade 2 (unless marked as above)

Hex Nuts

Nuts with no markings are to be treated as S.A.E. Grade 2



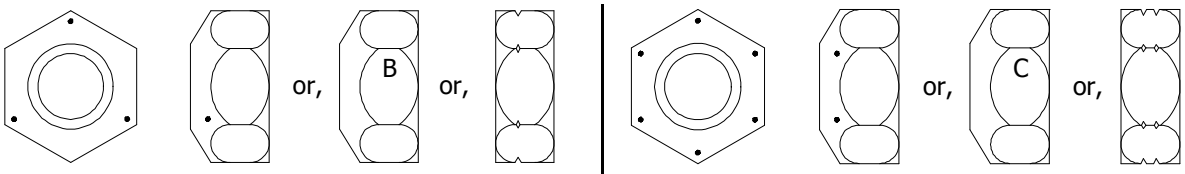
S.A.E. Grade 5

S.A.E. Grade 8

Hex Lock Nuts (stover)

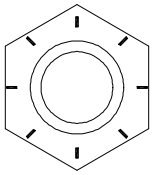
Lock nuts use a letter to indicate the grade of the nut. Grade A' locknuts would be the equivelent of Grade '2' hex nuts, Grade 'B' as Grade '5' and Grade 'C' as Grade '8'.

NOTE: Nuts with no markings are to be treated as S.A.E. Grade A



S.A.E. Grade B

S.A.E. Grade C



Grade L'9

Other Nuts

Other nuts used by Taylor-Dunn® should be treated as S.A.E. grade A

Suggested Torque Values (non-critical hardware)

Diameter and TPI	Grade 2 Tightening Torque (ft-lb)	Grade 5 Tightening Torque (ft-lb)	Grade 8 Tightening Torque (ft-lb)	L'9 Tightening Torque (ft-lb)
1/4-20	4-7	7-10	10-14	11
1/4-28	5-8	8-12	11-16	12
5/16-18	9-14	14-21	20-29	22
5/16-24	10-15	15-23	22-33	25
3/8-16	16-24	25-37	35-52	40
3/8-24	18-27	28-42	40-59	45
7/16-14	26-38	40-59	56-84	65
7/16-20	29-43	44-66	62-93	70
1/2-13	39-59	60-90	85-128	95
1/2-20	44-66	68-102	96-144	110
9/16-12	56-84	87-131	123-184	140
9/16-18	63-94	97-146	137-206	160
5/8-11	78-117	120-180	170-254	195
5/8-18	88-132	136-204	192-288	225
3/4-10	138-207	213-319	301-451	350
3/4-16	154-231	238-357	336-504	390
7/8-9	222-334	344-515	485-728	565
7/8-14	245-367	379-568	534-802	625
1-8	333-500	515-773	727-1091	850
1-14	373-560	577-866	815-1222	930
1.125-7	472-708	635-953	1030-1545	1700
1.125-12	530-794	713-1069	1156-1733	1850
1.25-7	666-999	896-1344	1454-2180	2950
1.25-12	738-1107	993-1489	1610-2414	3330

Suggested Torque Values (critical hardware)

Torque Table

Group	Description	Torque Range Ft-Lbs	In-Lbs	Nm
Brakes				
	Brake bolt (disc brake body)	11 - 11	132 - 132	15 - 15
	Brake line tube nut fittings	12 - 13	144 - 156	16.3 - 17.7
	Brake spider bolts (Dana 160mm hyd brakes)	25 - 35	300 - 420	34 - 47.6
	Brake spider bolts (Dana 160mm mech brakes)	15 - 19	180 - 228	20.4 - 25.8
	Brake spider bolts (Dana 7x1-3/4 brakes)	16 - 20	192 - 240	21.8 - 27.2
Electrical				
	Battery terminals	8 - 9	96 - 108	10.9 - 12.2
Front Axle				
	Front spindle nut	-	-	-
	Note: Refer to maintenance section in the service manual			
	King pin	-	-	-
	Note: Refer to maintenance section in the service manual			
Rear Axle/Transmission				
	3rd member Gear case cover (GT drive)	45 - 50	540 - 600	61.2 - 68
	Axle bolt (GT drive)	275 - 275	3300 - 3300	374 - 374
	Axle hub nut (Dana)	95 - 115	1140 - 1380	129.2 - 156.4
	Axle tube to center section (Dana F-N-R)	25 - 35	300 - 420	34 - 47.6
	Carrier cap bolts (Dana)	100 - 120	1200 - 1440	136 - 163.2
	Differential Cover plate (Dana H12)	18 - 25	216 - 300	24.5 - 34
	Drain plug (Dana H12)	25 - 40	300 - 480	34 - 54.4
	Drain plug (GT drive)	21 - 25	252 - 300	28.6 - 34
	Gear case to 3rd member (GT drive)	18 - 20	216 - 240	24.5 - 27.2
	Motor mounting (GT/Dana)	6.5 - 7	78 - 84	8.8 - 9.5
	Pinion nut (F2/F3)	175 - 175	2100 - 2100	238 - 238
	Pinion nut (GT drive)	154 - 169	1848 - 2028	209.4 - 229.8
	Ring gear (Dana)	35 - 45	420 - 540	47.6 - 61.2
	Wheel lug nut	75 - 90	900 - 1080	102 - 122.4
Steering				
	Ball joint clamp	28 - 32	336 - 384	38.1 - 43.5
	Ball joint nut	40 - 45	480 - 540	54.4 - 61.2
	Pitman nut (18-308-21 steering gear)	75 - 100	900 - 1200	102 - 136
	Pitman nut (18-308-25 steering gear)	181 - 217	2172 - 2604	246.2 - 295.1
	Rod end nut	20 - 25	240 - 300	27.2 - 34
	Steering shaft pinch bolt	24 - 26	288 - 312	32.6 - 35.4
	Steering wheel nut (18-308-21 steering gear)	28 - 32	336 - 384	38.1 - 43.5
	Steering wheel nut (18-308-25 steering gear)	72 - 86	864 - 1032	97.9 - 117
Suspension				
	Leaf spring hangers	-	-	-
	Note: Refer to maintenance section in the service manual			

APPENDIX C: BRAKE LINING HANDLING PRECAUTIONS

⚠WARNING

Taylor-Dunn does not currently supply asbestos fiber-brake pads/shoes with any vehicle. However, there is the possibility that the original brake pads/shoes were replaced with aftermarket pads/shoes containing asbestos. Since this possibility does exist, the brake pads/shoes should be handled as if they do contain asbestos.

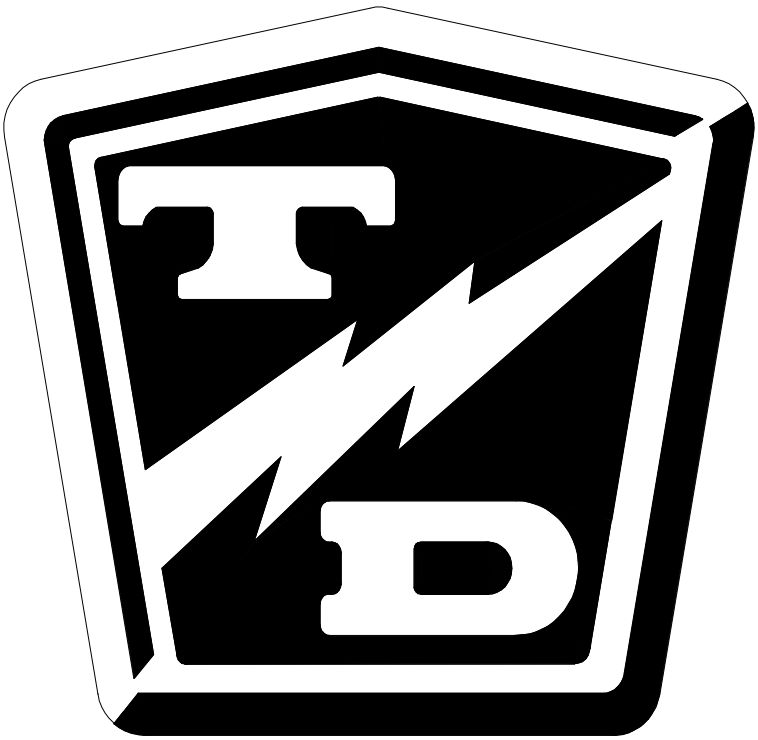
Never use compressed air or dry brush to clean the brake assemblies. Use an OSHA approved vacuum cleaner or any alternate method approved by OSHA to minimize the hazard caused by airborne asbestos fibers and brake dust.

Do not grind, sand, break, or chisel the brake pads/shoes, as this will cause unnecessary dust, possibly releasing asbestos fibers in the air.

Always wear protective clothing and a respirator when working on the brake pads/shoes or their associated components.

Inhaled asbestos fibers have been found to cause cancer and respiratory diseases.

Do not drive the vehicle if any worn or broken part is detected in any part of the brake system. The cause of the damage must be repaired immediately.



Taylor-Dunn® Mfg.
2114 W. Ball Rd.
Anaheim, CA 92804
(800)-688-8680
(714) 956-4040
(FAX) (714) 956-0504

Mailing Address:
P.O. Box 4240
Anaheim, California 92803

Visit our Website:
www.taylor-dunn.com